1859 PUBLISHED WEEKLY 1920

AMERICAN GAS ENGINEERING JOURNAL

FORMERLY

AMERICAN GAS LIGHT JOURNAL

VOL. CXII., No. 3
WHOLE No. 3228

NEW YORK, SATURDAY, JANUARY 17, 1920

Subscription $3 per year
$4 Canada $5 Foreign

GENERAL LIBRARY
JAN 21 1920
UNIV. OF MICH.

INDEX TO CONTENTS, PAGE 51

ADVERTISERS' INDEX, PAGE 24

THE KOPPERS COMPANY

Designers and Builders of

BY-PRODUCT GAS PLANTS
BENZOL RECOVERY PLANTS
MOTOR FUEL RECOVERY PLANTS
AMMONIA RECOVERY APPARATUS
TAR DISTILLING PLANTS
BY-PRODUCT GAS PRODUCERS
GASOLINE ABSORPTION PLANTS

CONSULTING ENGINEERS
ON THE OPERATION OF BY-PRODUCT COKE
AND GAS PLANTS AND THEIR AUXILIARIES

PROPERTIES EXAMINED

ENGINEERING REPORTS AND
FINANCIAL STATEMENTS PREPARED

COALS ANALYZED AND TESTED

THE KOPPERS COMPANY

PITTSBURGH, PA.

AMERICAN GAS ENGINEERING JOURNAL. Jan. 17, 1920. Vol. CXII, No. 3. Published Weekly by American Gas Light Journal, Inc., New York, N. Y. Subscription Price $3 per Year; $4 Canada; $5 Foreign.
Entered as second-class matter January 9, 1917, at the post-office at New York, N. Y., under the Act of March 3, 1879.

American
Gas Engineering Journal

FORMERLY THE AMERICAN GAS LIGHT JOURNAL

Vol. CXII, No. 3 NEW YORK, JANUARY 17, 1920 Whole No. 3228

Making Industrial Gas Consumers

Points of Undesirability of the Private Consumer—Wherein the Industrial Load, Increased Almost to an Even Ratio, Provides the Remedy

By L. W. ALWYN-SCHMIDT

H. M. Crawford shows in a recent copy of the AMERICAN GAS ENGINEERING JOURNAL that the sale of gas to industrial consumers comprised only 17½ per cent of the total distribution of a representative gas company. It may be assumed that conditions are very similar all over the United States, and that the industrial consumption of gas is still very much behind that consumed by private users.

The fact appears to be rather encouraging for the gas works of this country, as it opens a way for a further increase of their distribution by simply enlisting the industrial consumer. The private consumption of gas in any neighborhood is very much limited by local conditions.

Take a city of 100,000 inhabitants and another of approximately the same size, and it will be shown that the rate of private consumption is practically the same in each city, provided the geographical position is similar.

There are the same lamp hours and approximately the same number of lamps for each household, the same graduation of consumers as to their average consumption and the same conditions as to general lighting and gas heating.

To increase the private consumption of gas requires quite exceptional efforts. It means fighting any competition in the district, and it is doubtful whether the result will justify the outlay. No amount of hard work will induce a private consumer using gas for ordinary lighting to burn more gas than he actually requires.

We have to invent for him new means to increase his consumption by installing in his house machinery consuming gas or by actually making him negligent in the use of gas, the latter being certainly not in the interest of the gas company nor in that of the nation.

Increasing private consumption, therefore, has come down to a system of keeping a close watch upon new installations, so as to retain them for gas lighting, and of improving generally the application of gas in the district as to make it a more useful way of lighting and heating.

To obtain by this means an even 5 per cent increase of the sales during one year in a district with a stationary population must be called an accomplishment. While the sales force which has produced this result must be complimented upon its success, there is no denying that the gain for the plant as a whole is not very important and can easily be surpassed by a stronger application upon the industrial field.

THE ECONOMIC SIGNIFICANCE OF INDUSTRIAL FUEL

Mr. Crawford's figures deserve for this purpose a more than fleeing interest. Industrial gas consumption differs in many of its most essential points from private gas consumption. In the private home gas is either employed for lighting, cooking or heating.

The period of these uses is limited to certain hours of the day. Gas for lighting is withdrawn, with very few exceptions, only during the dark hours. Consumption expands with the approach of the winter and shortens during the summer. Gas for cooking is required only during three or four hours for any stretch of time, and the gas consumption for ordinary heating purposes is both limited by the cold season as well as the time of the day, the length of occupation of the room, and other factors.

Private gas consumption, therefore, affects the supply center in a rather freakish manner. It expands very rapidly during the certain hours and decreases just as rapidly during others.

While the effect upon the operation of the gas plant is not so serious as in the case of the electrical supply industry, there is nevertheless a certain irregularity which might be avoided in the interest of a smooth working of the equipment of the gas plant.

ADVANTAGES OF INDUSTRIAL FIELD

Industrial gas consumption is more regular. Leaving

alone the question of lighting and heating the factory rooms, gas is used principally for feeding gas motors, heating boilers, and for all kinds of industrial operations requiring the direct application of the gas flame, as welding, etc.

In each case the consumption of gas is very regular. Our actual experience in this respect is still very small.

Take, however, a large jewelry factory requiring gas for many of its manufacturing processes, and only a passing control of the meter will show how evenly gas is consumed by such an establishment.

This consumption starts with the beginning of the working hours and continues throughout the whole day. It varies little in the different seasons of the year and remains fairly stationary, even through the so-called slack season.

To have so regular a consumer is certainly a boon to any gas company. It introduces into the technical operation of the plant an element of security that will be appreciated fully by each gas man, and it makes the regulation of the production policy more easy than in the case of the ordinary private trade.

The special advantage accruing to the gas company by the possession of a large industrial trade, however, lies doubtless in the fact that the industrial consumer operates supplementary to the private consumer.

The largest demand from the private consumers is experienced always after five in the evening, when cooking begins in the kitchens and when the daylight is failing. This is exactly the time when the industrial consumers begin to shut down.

If it should be possible, therefore, to increase the industrial consumption of gas in any given neighborhood from 17 per cent, say, to 33 or even 40 per cent, a much better distribution of the gas demand would be obtained, which would have a very powerful effect upon the general operation of that particular plant.

The gas industry is still very imperfectly organized as regard its relation between consumer and producer.

Every gas engineer knows that any plant could be operated much more effectively if it was running on an all-the-day-round high-peak consumption.

But while this has been worked out over and over again theoretically, there has not yet been made any extensive attempt to transplant the theoretical example into reality, for the simple reason that nowhere the necessary conditions for such an experiment have existed.

No doubt running a gas plant on the principle of a permanent high-peak consumption necessitating a correspondingly smaller reserve of gas during each day would necessitate a change in all the present rules of gas making. The change, however, should be possible and it should result, according to all commercial and technical rules, in a considerable saving in cost and equipment.

As matters stand to-day, our gas industry has to collect gas during the day for the consumption of a few hours. It would then collect less gas but would hand out more during each hour of the day than is the case now with most gas companies.

Industrial Field Deserves More Attention

A strong application of the sales force upon the industrial field, therefore, promises not only an addition to the distribution of the plant, but it holds an additional although not quite certain promise for a reduction of operating expenses.

To make this application effective, however, two conditions are necessary. The offer must be made attractive to the industrial consumers, and the distributing company must know what amount of gas is really required by each group of consumers for industrial purposes.

Mr. Crawford's list, for instance, mentions restaurants.

A restaurant requires only a comparatively small amount of gas for cooking in comparison to the very large consumption it may need for lighting, at least during the hours when the lights have to be burned.

The same is the case with many others of the industries mentioned on his list. It would, therefore, be very interesting to know how the consumption splits up in each case.

A European gas concern which has taken this matter of industrial consumption into serious consideration several years ago has made the experiment of separating the gas supply for lighting from that required for proper industrial purposes by installing a separate meter at the industrial outlet of the gas connection. This, however, cannot be done in every instance.

Most gas installations in industrial enterprises are of the most primitive sort. One only need go over any of our industrial enterprises using gas for lighting and general industrial purposes to realize the truth of this statement.

In most instances the gas for the industrial uses, as for light smelting, is taken by the aid of composition pipes from the ordinary gas-lighting pipe, or the conduct pipe is even attached to the gas jet.

Under these circumstances the industrial and lighting gas consumption is hopelessly intermixed. They should be separated.

This is not only required for experimental purposes but also to give the industrial consumer better service.

The industrial consumer requires especially a regular flow of the gas so as to secure an even pressure. This cannot always be obtained by running the lighting and industrial supply over one pipe. The latter is bound to suffer in strength as soon as the lighting jets are in use. Wherever a separation, therefore, is possible this should be effected, and it should be made a rule wherever new installations are made. The effectiveness of the supply will be soon increased in every respect. A piping system installed for giving light cannot be carried along lines where it can be brought most effectively to bear upon the industrial equipment. So it is doubtless a much better arrangement to carry the lighting pipes along the ceiling and let the industrial conduct pipes run directly behind the workbenches. This separates effectively the two sources of gas in the factory and permits in turn the insertion of a second meter between the principal meter and the industrial conduct pipes.

Study Character of Industrial Consumption

This again will make it possible to check more thoroughly the consumption of gas from the industrial source. Our gas men when attempting to increase the industrial consumption of gas must not forget to take into consideration the competition of electricity in the industrial lighting field. It would be wrong to admit that electrical lighting has not certain advantages in industrial lighting against gas, or that at least the in-

dustrial consumer is inclined to concede to electricity such advantages.

If we assume, therefore, that the industrial consumption will comprise in each instance both the lighting and straight industrial consumption, we may find ourselves disappointed. The commercial estimate would be wrong.

To know, therefore, the approximate consumption of gas for purely manufacturing purposes in each industry is an added advantage to be gained by the special meter.

In the European instance the additional meter is said to have been proven of considerable use in making up the industrial consumption rates, although the company has never published the results of its investigation.

Special Rates for Industrial Consumers

Special favorable rates seem to be a great inducement to the industrial consumer and have helped everywhere to introduce the consumption of gas in the industrial field.

The Point of View of the Industrial Consumer

The industrial consumer views the use of gas for the purposes of his factory with different eyes than the private consumer.

Most private consumers do not analyze closely the comparative heating and lighting value of the different modes of heating and lighting.

If they would do so the application of the present-day known heating and lighting methods certainly might be much different from what it is.

For the industrial consumer, however, a cheap and effective source of power and heat is of considerable importance. It may secure or undo his competitive position by decreasing or increasing his manufacturing cost. Also, there is a vast difference between the comparatively small consumption of gas by the ordinary private user and the big manufacturing concern using large quantities of gas.

How true this is the writer has once seen in a very prosperous city of a matter of 40,000 inhabitants supporting an electrical central station, a large gas plant and a great number of industrial enterprises.

Several of these plants, among them a large bicycle concern, had equipped their private power stations with a high-power gas engine for which they purchased the gas from the local gas plant.

One day the community decided it would raise the cost of gas upon the consumer, including the industrial buyers of gas. This incensed the latter consumers to such an extent that they installed their own small gas-generating stations.

The result was rather astonishing to the city gas undertaking, because it proved conclusively that the industrial producers and consumers could make their gas cheaper than they bought it from the city gas plant.

The case shows that competitive industrial gas rates to the factories is not only a matter of getting the business of these consumers but also one to enable the industrial consumer to make use of gas for manufacturing.

After all, business is not conducted entirely on sentiments, but there is also injected a strong measure of dollars and cents. It is this argument of cheaper and more effective operation which will bring the trade of the industrial consumer to the gas plants of this country and our gas men will do well to employ it to its fullest measure.

To introduce gas to the local industry as an industrial fuel and not only as a source of lighting will require a most thorough campaign of education. As it is, the number of industrial consumers is limited in each city and each industrial establishment in turn requires again a special adaptation to its individual problems.

This is a serious handicap to the progressive gas engineer willing to develop his industrial business.

How to Get Industrial Business

The salesmen of the gas plant should study carefully the application of gas in each group of industrial enterprises and work their prospective clients in industrial groups, presenting to each a statement of his particular case.

During the war, for instance, excellent results were obtained in this respect by turning our coal-fired bakeries into gas-fired ones. The change could be made in most instances with little difficulty, and the piping arrangement did not cost much money. But the case of the baker was comparatively easy for the salesman. The baker could not get coal and he was only too glad to get gas.

To accomplish the same results might be more difficult just now where economic pressure is less severe. The argument for the change, therefore, must be more convincing. It must show the consumer where he is likely to save and where the advantage in the use of gas will lie. That it does away with a couple of firemen in the case of an ordinary power plant is just one of these arguments, and every resourceful salesman no doubt will find a great number of similar strength.

Having once realized the importance of the industrial consumer for the stabilization of the gas business of this country, our leading gas plants can be expected to take a considerable interest in the expansion of this part of their business.

But while the large gas plants most likely will have the best results as to the quantity of their sales, it is certain that the largest benefits will go to the gas enterprises in the medium-sized cities.

These cities require more than any other the guiding hand of an enterprising public utility that will not see only its own advantages but will also apply its energies for the improvement of the community life of the whole city.

Giving a city a cheap source of industrial power and instructing it in the use of that power not only helps this city to produce more rapidly but it sets also free many hands formerly engaged in individual power production that now may apply themselves to other pursuits.

In our present time of rapidly decreasing labor supply any means of meeting the growing emergency must be welcomed.

The gas industry, by preparing itself to take hold of the industrial supply business, is helping the country to tide over a very serious situation, while producing a new reason for its continued success and growth as a public utility.

Cleaning Blast Furnace Gas by Electrical Precipitation

Forty-five to Fifty Thousand Cu. Ft. of Gas per Minute Cleaned at American Manganese Manufacturing Company, Dunbar Pa., with Electrical Precipitation Process —Results by Actual Measurement Show This Process Can Clean Gas to Less Than One-Tenth Grain of Dust per Cubic Foot of Gas at Standard Conditions

The cleaning of blast furnace gases is a vital factor in obtaining plant efficiency, owing to the effects of dust on stoves and boilers and the lowering of the available heat in the gases. The trend of both domestic and foreign gas cleaning practice shows the foreign method to be in the lead. Improvement of the domestic practice is therefore a vital necessity, because the utilization of blast furnace gas is of prime importance, not only in the economies to be effected in the operation of the blast furnace plant, but in the very production of the metals at anything like salable figures.

The following is a description of the electrical precipitation process, a new type of blast furnace gas cleaner that has been installed and is now in operation at the furnace of the American Manganese Manufacturing Company at Dunbar, Pa. This is an extract from a paper prepared by N. H. Gellert, president, and K. V. Laird, assistant electrical engineer of the Gellert Engineering Company, which was delivered before the Philadelphia Section, A. I. S. E. E., at the Engineers' Club in Philadelphia, and later reprinted in the Journal of the Engineers Club of Philadelphia.

The cleaner herein described is the first of its kind in existence and is an adaptation of the Cottrell electrical precipitation process to the blast furnace. This process, while new to the blast furnace, has been in extensive use throughout the country in the cement industry as well as in various metallurgical processes.

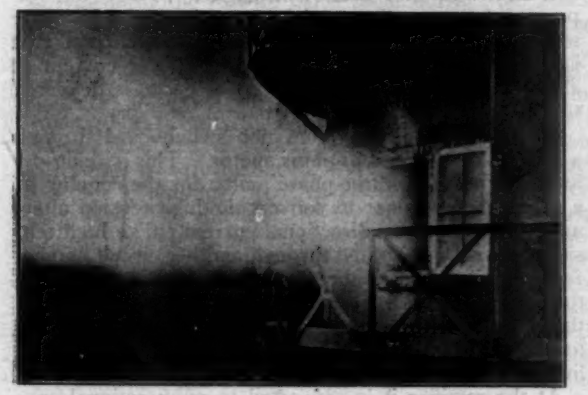
The primary function of a blast furnace, of course, is to reduce iron ore to metallic iron and remove from the metallic iron those impurities which would make it objectionable for the purpose for which iron is usually intended. In addition, however, to being the instrument for the conversion of iron ore to its metallic state, the blast furnace is also a gas producer. This blast furnace gas, which is produced by the chemical reaction upon the carbon in the coke that is charged into the top of the furnace, has a heat value of from 90 to 100 B.t.u. per cu. ft. at standard conditions of temperature and pressure. The carbon in this gas, which has a combustible value, exists in the form of CO and represents 50 per cent of the total carbon in the coke that was originally charged into the furnace. The gas that issues from the top of the furnace, however, contains, besides the inflammable and non-inflammable gases, substances that are not gases at all. These substances come off in the form of vapor dust and fume. If the gas issuing from the furnace were a pure gas, and not at all vitiated by substances foreign to a pure gas, the problem of securing the greatest possible efficiency in the burning would not be a severe one, at least it would not present difficulties that have in the past been encountered. But the dust and fume content of the gas makes burning at its maximum efficiency a difficult problem, because these foreign bodies not only absorb a considerable amount of heat, due to their high specific heat, but also because by deposition in the combustion chambers and brickwork and on the tubes of the stoves and boilers, respectively, they effectively insulate the very portions of the stoves and boilers whose function it is to absorb the greatest possible amount of heat during the combustion of the gas.

Clean gas will yield better combustion results and give greater efficiencies per cubic foot burned than will raw gas. Also, the inefficiencies of gas combustion are not the only things to be feared when dirty or raw gas is used. The tremendous saving that may be obtained by properly cleaning the gas, due to the longer life of the brickwork in the hot stoves and boilers, is not an inappreciable portion of the economies to be found in the use of clean gas.

In the United States the effort to remove this fine fume and dust was for a long time confined to that of wet cleaning. The objections to wet cleaning have been numerous, and it is quite evident that blast furnace operators of every country are turning away from wet cleaning and looking for some method by which gases may be cleaned in a dry state. One of the main objections to a wet cleaning process is the loss in sensible heat due to the reduction of temperature of the gas when using large quantities of water which are necessary in order to get the best results from this method. A table taken from a paper on this subject read before the American Institute of Mining Engineers in 1914 shows that nearly 8 per cent greater British thermal unit value exists because of the sensible heat in the gases when using unwashed blast furnace gas at 400 deg. Fahr. and with 35 grains of moisture per cu. ft., than can be obtained when using washed gas at 70 deg. Fahr. and with moisture saturation at 70 deg. Fahr. This means that about 8 per cent of the coke used in producing iron with washed gas might have been saved if the sensible heat of that gas had not been lost in the process of washing. When using 750 tons of coke per day, at a 500-ton blast furnace, about 60 tons of coke might have been saved per day. At $6 per ton, the saving is about $360 per day and for 300 days the saving is about $100,000. This, of course, is a worthy economy.

Few blast furnaces in the country are not equipped with some kind of cleaner. A great many of the furnaces, perhaps most of them, have what is commonly known as a dry dust catcher. The dry dust catcher is simply a large chamber conical at the top and bottom and cylindrical in the center with an area sufficient to decrease the velocity of the gas in its path from the

furnace to the hot stoves and boilers. Various dust catchers have different combinations to cause mechanical impingement, change of direction and decrease of velocity of the gas. The best of them remove about 50 per cent of the total amount of dust and fume carried in the gas. This 50 per cent is the heavy 50 per cent, that portion of the dust which is gritty to the feel and consists of fairly large particles of material.



ELECTRICITY OFF; DIRTY GAS PASSING THROUGH PRECIPITATOR BUT NOT BEING TREATED

Little if any of the fume is removed by the dry dust catchers. The potash content of any dust is a fairly good indication of the fume in the dust. In the dry dust catcher will be found dust high in iron and coke content. The coke particles can be very readily distinguished and the sample of dust is spread on a small sheet of paper. The balance of the dust and fume which escapes from the dust catcher is the portion which usually causes the trouble in the hot stoves and boilers. This dust is very fine in nature and when collected is in the form of an impalpable powder with very few gritty particles in it. As it exists in the gas, it is in the form of fume and also in the form of dust. The fume is made up of particles of solid material so finely divided that they approach their molecular condition. Since fume acts in a great many respects as a gas, perhaps the best conception of a fume, even though it is not scientific, is that of a vapor of a solid. This fine dust and fume must be removed from the gas before any economy can be effected.

Theory of Electrical Precipitation

To get away from the necessity of wet washing, the European iron industry some time ago devised a dry cleaner that would remove the dust to a greater degree than the wet cleaners, and developed it to a point where it took the place of intensive scrubbers. Due, however, to the fact that the filtering medium was made up of material that could be destroyed by the high heats normally found in blast furnace gas, it was necessary to cool the gas before passing it through the cleaner. A great deal of the benefit, therefore, obtained by dry cleaning was automatically eliminated by this action.

Any screen type of cleaner which attempts to filter out particles of dust and fume, even when the filtering medium is not destroyed by the normal heats of the blast furnace gas, must be sufficiently fine in nature to present a hole smaller than the finest particle of dust and fume going through in order to successfully remove the objectionable solid material in the gas. If the screen is so fine that it will remove the particles of fume, the back pressure will be enormous and the screen will clog up quickly. If the screen is designed with apertures large enough to prevent any considerable back pressure, the fine particles of fume and dust will go through. The problem, therefore, of screening the fume and dust out of the blast furnace gas is not a simple one.

This same difficulty was encountered during the war in the elimination of mustard gas, existing not in the

ELECTRICITY ON A FEW SECONDS AFTER PREVIOUS PICTURE; NO OTHER CHANGE MADE; SAME GAS VOLUME ISSUING AS BEFORE, BUT PRECIPITATOR NOW CLEANING

form of gas, but in the form of dust and fume of a very fine nature. When the mask was made with a filter fine enough to keep all of the mustard gas out, breathing was exceedingly difficult. When the mask was made to make breathing easy, mustard gas fumes penetrated the mask at times. The American Chemical Warfare Service, at the time of the armistice, had developed an apparatus for removing the danger due to the inbreathing of mustard gas and the difficulty of breathing through a very closely packed filter, and the apparatus that they decided on was exactly in principle the kind of apparatus that is now being applied to dust and fume from blast furnace gas.

The principle involved is not a difficult one and can most easily be understood by conceiving of a gas passing through an invisible electrical screen so fine that the finest particle of fume cannot pass through, yet occupying no space, having no material body and consequently presenting no source for back pressure. It is by means of this electrical screen interposed between the outlet of the furnace and the inlet to the hot stoves and boilers that blast furnace gas may be cleaned of its dust and fume content to a degree finer than any mechanical screen can clean it without the considerable loss of back pressure.

The reason for this is that the electrical screen is not woven of wires, but is woven of lines of electrical force. The threads of force constituting the screen are so closely knit together that a substance must drop below its molecular form to get through when conditions are correct for the screen to operate. Yet, these lines of force, having no material body, do not interrupt

the flow of gas, on which they have no effect whatever. In a simple manner, the action of an electrical cleaner may be described as follows:

The gas is conducted through a vertical pipe. It enters from the bottom of the pipe and issues from the top. An electrode chain or wire is suspended vertically in the exact center of the pipe. It is held taut by a weight at the bottom. This electrode is charged with high tension unidirectional current. It therefore must be suspended on the proper insulators, which are capable of withstanding the potential under which they are impressed. The pipe itself is grounded. When the dirty gas passes through the pipe and comes in contact with the charged electrode, it becomes ionized. As the electrode is negatively charged and has a corona discharge due to the high potential impressed upon it, the ionization of the gas is rapid and thorough. The gas molecules carry the charge to the dust particles which for the most part are negatively electrified since the electrons prevail in the gas. Immediately upon being charged, the dust and fume particles are repelled by the electrode and are deposited on the sides of the pipe which interrupt their flight from the chain. Within the pipe, therefore, there are three forces in action. There is a vertical force due to the velocity of the gas which is carrying the dust and fume particles upward. There is the force of gravity which tends to carry the dust particles downward. Since the force due to the upward velocity of the gas is very much greater than the force due to the action of gravity, the resultant of these two is a vertical force upward. The third force is the force caused by the charging of the dust particles through the ionization of the gas. This is a horizontal force, as the action of the repelling of the particle from the chain is at right angles to the chain. The resultant of these two forces is a diagonal of a parallelogram, having both these forces as sides. If the vertical force is very great, too great for the particular pipe described, the horizontal force may not be sufficient to cause a resultant that would precipitate the particle of dust to the side of the pipe. While the particle of dust would be acted upon by the horizontal force, the resultant might be such that the particle would not travel to the side of the pipe within its length.

Application of the Theory to Practical Conditions

The problem, therefore, in electrical precipitation is to regulate the vertical force so that it is not too great and to regulate the horizontal force so that it is sufficiently great to form a resultant which will precipitate the particle of dust to the side of the pipe. The principle is not simply one of ionization and is not one of magnetism. The particle of dust does not stick to the side of the pipe because of the magnetism caused by the corona discharge and gas flow. The dust particle sticks to the side of the pipe because it is held there fast by the resultant electrostatic force that is acting upon it throughout the entire period of operation. It is as though an arm had extended diagonally from a point on the electrode and pinned the particle of dust to the side of the pipe with a finger and were holding it there without letting go. The control of the vertical force is, of course, the design of sufficient cross-sectional area in a precipitator to give what has been found to be the best velocity of the gas for precipitation purposes. To get the horizontal force necessary for precipitation is a question of design of electrical equipment. The voltage that can be impressed on the electrode is controlled by the gap between the side of the pipe and the electrode. This has erroneously led to the assumption that the bigger the pipe and the greater the voltage that may be impressed, the stronger the force that may be secured to act horizontally. This is not true, as the force varies inversely as the square of the distance between the object to be precipitated and the electrode, and even with higher voltage the impressed force on the particles may be less. In order to secure the unidirectional high tension current that is necessary for precipitation, ordinary line current at about 220 volts, sixty or twenty-five cycle, is delivered to the switchboard.

There is one circuit from this switchboard through a switch to the synchronous motor. This circuit delivers current to a three-phase motor for the running of a mechanical rectifier to convert the high tension alternating current to unidirectional current. The high tension current is generated through another circuit coming from the switchboard through a circuit-breaker, double-throw switch and five-tap switch to a transformer. At this point, the current is raised from about 220 volts to about 35,000 to 50,000 volts, as needed, and is delivered to the rectifier.

At the rectifier it is converted to unidirectional current and from that point passes into the precipitator. The use of the five-tap switch and other apparatus in connection with electrical precipitation will be later described.

Plant at Dunbar

The plant at Dunbar, like every other precipitation plant at blast furnaces that may be built, consists of two parts, the electrical house and the precipitators proper. It was impossible to place the electrical house on the ground, due to the fact that there was a shortage of room at Dunbar and that part of the electrical house had to be placed over an old blower engine house and another part had to extend out over a passageway. For this reason, the house was designed to be 23½ ft. above the ground line. Plenty of room was given for the placement of three sets of electrical equipment and the control panels and insulators that were necessary for the work.

The operating platform was placed outside the electrical house on the side nearest the precipitators so that the operator might be able to watch the precipitators from the floor of the electrical house without running downstairs. In this way a minimum of labor is expended during operation.

A few details in connection with the electrical house are of interest. Part of the top of the old blower house had to be torn down and the steel framework of the electrical house was set up. Protective screening was used around each electrical set to prevent any chance of accident. The only parts of the electrical apparatus besides the switchboard which extend outside the screening are the motors. All high tension equipment was placed behind the screening. The screen was made of expanded metal and thoroughly covered every part of the electrical equipment. In the house were contained three complete electrical units.

The electrical equipment draws its power from a local steam-driven General Electric 3, 450 KVA, 2,300-

volt unit operating at 150 r. p. m. The line voltage furnished by this machine is stepped down to 230 volts by a bank of two type S-25 KVA, 60-cycle, Westinghouse transformers connected in open delta. These transformers are located upon the wall outside of the electrical house and above the back of the switchboard. The switchboard stands in one corner facing the other equipment at its left. Each electrical set is completely surrounded by an expanded metal guard having but one door through which it may be entered. The niches provided for the motors place them outside the guard work and allow the operator to inspect them when in operation.

The switchboard consists of four panels, the right hand one of which is a feeder panel controlling the incoming line, prior to its connection with the switchboard buses. The incoming leads pass through the wall from the power transformer bank and enter an enclosed cut-out box containing three enclosed fuses. From here they pass under the floor and up the back of the switchboard to the top of the three-pole 500-ampere automatic overload, and no-voltage release oil circuit breaker mounted on the feeder panel. The question may occur to many as to why such a heavily rated oil breaker was chosen for this location. The reason is that five rectifier sets, four of which will be in continuous operation, are contemplated in the completed installation of four precipitators. The 500-ampere breaker will then take care of the two sets which will be operating on one of the phases and still have reserve capacity to handle the additional current of motors and other equipment. As now arranged the high tension transformers are each fed from a different phase. The overload feature of the oil circuit breaker trip is operated by current transformers which it is intended to use in connection with an integrating watt-hour meter should it be found advisable to install one. The three panels to the left of the feeder each control a complete unit of the installation; that is, one high tension transformer and rectifier motor. The motor driving the rectifier is a four-pole motor of the synchronous induction type.

The switching arrangement used in order to obtain the necessary flexibility has been made as simple as possible, there being merely two bus lines, one for each precipitator, passing over the three rectifier units. These bus lines, together with the outgoing lines to the precipitators and the transformer leads, are all of ½-in. conduit. The pipe itself carries the current in each case. Between the two bus lines and over each rectifier set a short extension of ½-in. conduit is fastened to the supporting steel work. This extends downward with a short horizontal section at its end. When any set is not operating, the adjustable connection which is used between rectifier and bus line is hung on this support, which serves double purposes of keeping the connection above the machine and at the same time effectively grounding it.

The connection used at Dunbar is made up of the spring connection attached to the rectifier shoe, then the resistance rod rack previously mentioned, a length of ½-in. conduit sufficient to reach the level of the bus lines and a hook of strap iron at its upper end. All high tension bus work is securely fastened to the ¾-in. pins which extend downward from the insulators by means of a rigid clamp. The outgoing high tension line to the precipitator passes through the wall in a porcelain bushing which is mounted in an iron casing.

Method of Carrying High Tension Lines to Precipitators

Immediately upon emerging from the wall on the outside this line is carried completely enclosed in an expanded metal guard extending to the high tension disconnecting switch. This switch is completely housed in guard work and is protected from the rain by a sheet metal roof. From this switch the line rises vertically inside a circular cage of expanded metal to a level above the top of the top balcony railing. This vertical run is supported upon suspension type insulators and the line extends from this point horizontally to the precipitator inlet connection. The precipitator top balcony is covered with guard work wherever it is exposed to this horizontal run of line.

GENERAL VIEW OF ELECTRICAL SET, SHOWING MOTOR, RECTIFIER, TRANSFORMER AND HIGH-TENSION CONNECTIONS, DUNBAR, PA.

The suspension insulators are, in each case, supported on an angle iron "stiff leg" extending out from the precipitator shell. The high tension disconnecting switches which are on the same level as the wall bushings, are operated by means of a handle extending downward to the second balcony, it being possible in this way to operate No. 1 precipitator switch from the electrical house platform and No. 2 by passing from this platform to the second balcony by means of a short stairway.

Auxiliary Safety Devices

There are certain auxiliary devices which are tied in with the circuits for the purpose of safety in operation. These consist of a means for cutting off the high

voltage transformer at the switchboard in case the doors in the safety guards surrounding the electrical sets are opened, a means for shutting down the entire precipitator installation in case the gas pressure goes off the mains, and a system of safety signal lights on the precipitators.

The device for preventing anyone entering the cage about the electrical set while the high tension is on is operated by a door switch placed on the hinge side of the door of the cages. This switch is closed when the door is closed and in each case is connected in series with the circuit breaker to voltage release coil of the particular set concerned. This device is a very valuable guard against accident through confusion of the various units in the mind of the operator.

The circuit breaker no voltage release mechanism is so arranged that a weighted trigger is held up when the door switch is closed and the voltage on, and drops as soon as the voltage goes off. This trigger, upon dropping, strikes the trip which opens the circuit breaker.

The safety pressure relay is located in the electrical house on the wall not far from the switchboard, and is operated by gas pressure conducted into the building through a ⅜-in. pipe connection. This pipe extends at its outer end through the top of the gas main. The relay consists of a U tube made up of pipe fittings in one leg of which a float is placed. The gas pressure is exerted downward upon the oil in one side and forces the surface on the opposite side upward to a height sufficient to balance the downward pressure. This upward movement of the oil level carries the float with it and closes the contact in the circuit of the no-voltage release coil of the main oil switch. When the gas pressure is released the float will fall, opening the first contact and closing another, which lights a warning signal light at the top of the main oil switch panel. This then gives a direct indication when pressure is either off the mains or of too low a value to operate the relay. This relay maintains an operating contact down to a pressure of about one-half inch of water. The reason for using this relay is that when the blast is completely removed, air is apt to be sucked into the mains through the leaky explosion doors and the like by the natural draft of the main stack. The relay as installed has operated for weeks without attention, and has never failed to open the oil switch when the pressure dropped.

Description of Precipitators

The second part of the precipitation plant, which, of course, is the business end of the plant, consists of the two electrical precipitators. These two precipitators are cylindrical in form and have conical tops and bottoms. The cylindrical shell part of the precipitator proper is nearly 36 ft. high, while the internal diameter is 12 ft. The shell is of 5/16-in. steel plate and is riveted at its seams gas tight. The whole thing is supported vertically on four built-up columns that are tied into the shell without any beam work, so that the stresses are transmitted directly to the columns from the shell. Each of these two shells at Dunbar are built with four platforms. The lowest one on the level with two doors on opposite sides of the shell is for ease in getting at the bottom insulator chamber. The second one, about one-quarter of the way up, is built at two doors similarly placed as are those on the first balcony for ease in getting to the bottom of the electrode chains, the steadying devices, and the bottoms of the pipes. The third balcony, a little over two-thirds of the way up, is placed for easy access through two doors for entrance to the tops of the pipes and the electrode hanging frame and the electrode rapping device, while the top and fourth balcony is used at the two top doors for entrance of the top insulator chamber.

The bottom of the precipitator is made up of a hopper within a hopper. The inner hopper is perforated with four holes protected by pipe canopies through which there pass structural members for supporting the steadying frame which prevents the chains from swaying and consequently getting out of place at the bottom.

These structural members extend from the top of the bottom insulators which rest on shoes riveted to the bottom of the outer hopper. In this way, the dust is kept in the inner hopper while a dead gas space exists in the outer hopper where the steadying insulators are located. Therefore, this outer hopper chamber is called the lower insulator chamber. The middle portion of the precipitator is that part in which the pipes are placed. These pipes, six inches in diameter and ten feet long, are placed through the header plate, strongly, supported at about three-quarters of the way up from the bottom of the precipitator and are held in position by a bracing frame placed near the bottom of the pipes so that no pipe has more than 1/16 of an inch play. The gas inlet is below the header plate from which the pipes are hung, so that any gas coming in has to descend around the pipes to the bottoms and can only find its exit through the pipes themselves. This part of the precipitator is called the pipe chamber or the pipe compartment.

Above this is the electrode chamber, in which is the electrode rapping frame which is used in rapping the dust from the electrode chains themselves and in which is also located the main frame from which all the chains were hung. Every part of this is subject to the free circulation of the gas. After the gas has reached this part of the precipitator, it is supposed to have been cleaned of most of its dust content and is ready for discharge into the main. It therefore goes into an apron-like opening extending centrally above the electrode chamber and is conducted through the pipe and out of the top of the precipitator into the gas main. Right above the apron of this outlet is placed a diaphragm supported by the proper kind of beams and structural members on which rest four insulators with cast iron bases from which the electrode frame in the compartment below is hung by means of structural members. All of these structural members pass through holes in this diaphragm closed up by floor bushings so that the top insulator compartment is free of gas. The inlet compartment or the compartment which contains the inlet bushings is located on the side of this insulator compartment, and has a small tank riveted to the shell itself by means of a small cast iron nozzle.

Structural supports are placed conveniently at various places for the guidance of the insulators and the high tension wire coming into the precipitator. Every portion of the high tension wire from the electrical house to the precipitator proper is protected by a screening, previously described, which is of strong material.

Located between the rows of pipes are the rapping hammers about midway of their length. Each pipe is

(*Concluded on page* 52.)

American
Gas Engineering Journal

SIXTY-FIRST YEAR

Published Weekly by AMERICAN GAS LIGHT JOURNAL, INC., 150 Nassau Street, New York, N. Y.

ELBERT P. CALLENDER, Pres. S. G. KRAKE, Vice-Pres. FREDERICK A. SOUTHWORTH, Sec'y-Treas.

EUGENE C. MILES, Editor

Subscription $3.00 per year, in cluding postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines; in Canada, $4.00; foreign, $500—Single Copies, 10 cents

Contents of This Issue

MAKING INDUSTRIAL GAS CONSUMERS—BY L. W. ALWYN-SCHMIDT 41

CLEANING BLAST FURNACE GAS BY ELECTRICAL PRECIPITATION 44

EDITORIALS 49

FROM THE JOURNAL SIXTY YEARS AGO 51

SUCTION GAS FOR MOTOR BOATS 53

MERCHANDISING GAS—
THE SIMPLE TRICK OF WRITING NEWSPAPER ADS 54

PATENTS PERTINENT TO GAS INDUSTRY 57

NEWS OF THE GAS INDUSTRY 58

PERSONAL NOTES 17

CONSTRUCTION NOTES 18

As the Journal Views It

Representative in Varying Degrees

It is to the advantage of the gas industry that there be one authoritative voice that can with confidence speak for it.

The American Gas Association essays to assume this role, and it is representative of the major part of the industry, as measured by volume, and has co-operating whole-heartedly with its aims the best minds of the American gas industry.

Yet were it to go before some national bureau, say, with this claim, its pretension might be open to challenge.

Of course, we know that this company or that individual, who are not listed as members, are not unlisted through lack of sympathy with its aims or incredulous as to its potentialities towards accelerating progress and development in our field. Doubtless, too, these unlisted units would be quite content to have the association constitute itself their spokesmen.

But this does not constitute the proof that the association might some time be called upon to be present. Its only effective answer to such a challenge is a membership list in practical effect covering completely the American gas industry.

We are informed that the American Gas Association is about to launch a campaign to round out its membership. Its effort should meet with ready success.

There is not a gas man or a gas company that has not benefited in some degree through the work it has already done. That is one drawback, to the mind of one essentially selfish or insistent that the other

fellow do his share, to any associated effort in any particular field of activity. Those who do not put their shoulder to the wheel benefit almost alike with those who do.

But there are few of the parasite type in the gas field. There are few shirkers. Each unit is willing and eager to carry its share of the common burden.

The American Gas Association is a necessary institution in the gas field. No gas company, however small; no gas man, however obscure, can honestly argue out of a degree of responsibility for its maintainance. And this responsibility is not alone a material one; it is not funds so much that the association needs as it is morale. Historians tell us that these United States were a very good sort of a nation to be a part of even when their income was confined almost to the returns from agriculture and shipping.

Those who are directing the affairs of the American Gas Association, regardless of how efficiently they are discharging their functions at present, could not but be stimulated and inspired to a much greater degree had they the confidence that practically every gas company and practically every gas man was actively behind all their efforts and all their contentions; lively appreciative of their work in his behalf; "and there's my John Hancock to prove it."

Cut Down the Overhead by Increasing Production

There doesn't seem much incentive, when selling prices are so low as to afford but slight margin of profit, to go on trying to stimulate demand. That is, of course, to the man of narrow vision. The fellow who sees some distance ahead of his nose, meantime, is complaining bitterly of the difficulty of finding salesmen.

Public utility plants in the United States represent an investment of over three billion dollars. A reasonable rate of interest on this sum, say 5 per cent and a nominal cost of upkeep, means, idle or busy, these plants cost annually three hundred million dollars or more. Let them all stand idle a day and the loss is close to a million dollars a day. Run them at nominal capacity and this overhead is meagerly provided for and perhaps a small margin of profit. Run them at forced capacity and overhead of the kind enumerated remains practically stationary.

We have a plant in which structures, land and equipment cost three hundred thousand dollars, which can be driven to produce and distribute two hundred thousand cubic feet of gas per day—fanciful figures of course. Interest at five per cent on this sum amounts to fifteen thousand dollars a year.

Standing idle the interest cost alone would be approximately forty-one dollars a day. Keeping it up-taxes, etc., would add, say, another forty-one dollars a day. We have a total of eighty-two dollars a day all dead loss.

Producing a hundred thousand cubic feet a day and selling at two dollars a thousand we could get from this plant two hundred dollars a day. To get it we would have to add to our fixed cost of eighty-two dollars a day the cost of materials and labor of producing the gas and getting it to the selling point and of making good the increased depreciation due to wear and tear of active operations. Say we could accomplish this at a dollar eighteen cents a thousand. We would then just balance up.

Producing our maximum, two hundred thousand cubic feet of gas per day, our fixed charge would remain constant. Our production and distributing cost, we will say, will double. We have attained a point where we get eighty-two dollars a day profit.

Running the plant to the limit will not prove the panacea for all our financial difficulties. But in a good many cases it may spell the difference between profit and loss.

Old man cost of plant and upkeep, regardless of usage, is a glutton for money. The only way to deal with him is to feed him what he demands; then produce so much more that his inroads are an incident rather than a death knell.

And production is dependent upon consumption. If there was ever a time in the gas industry when big sale's efforts were necessary—that time is NOW.

Paying with Potatoes

It would be a fine business for gas companies if they could demand payment for their gas in bushels of potatoes in the proportion that potatoes were selling at the time their present rates were fixed, or in pairs of shoes, overcoats, bread, milk, coal, etc. We remember when potatoes could be gotten at eighty cents a bushel; that was about the time when a State Legislature, in solemn conclave, by odd coincidence, set the same rate for a big gas company for a thousand cubic feet of gas. If that gas company could genially inform its consumers that hereafter their wagons would pick up a bushel of potatoes for every thousand feet of gas used, we imagine there would not be much talk on its part of ruinous rates—this despite the great expense it would undoubtedly be put to in handling its bulky revenue.

Superficially we consider we pay the laborer in gold—and the laborer really is at the bottom of the changed prices for everything. But in reality, though indirectly, we pay him so many pounds of meat, so

many bushels of potatoes, so many pairs of shoes, etc. If he requires a pound of meat a day to repair his bodily wastage it is certain that we will have to provide him that pound of meat whether it requires that we find two parts of gold to provide it with or one.

To the best of our knowledge gold is no less available on the earth to-day than it was five years ago. Yet production has been cut in half. It doesn't pay to get it out.

The mine owner must supply double and treble the quantity of his mined product he formerly did to enable his workers to obtain the same number of pounds of meat, quarts of milk, pecks of potatoes, pairs of boots, they formerly needed and still need. In turn he must so compensate the machinery manufacturer, the supplies man, etc., that they in turn can do the same by their workers.

And from what is left the mine owner cannot buy the potatoes he himself did, even to a quarter of the extent, nor even the number of automobiles. The business doesn't pay, so in goodly numbers he has cut down on operations.

And it is in parts of this metal, that has depreciated so it is not worth taking out of the ground, that gas companies are paid for their gas which has in every respect become a vastly more costly commodity to produce. The tragedy of it is that the parts are no greater in weight than they were a few years ago when each part had a double value.

Vexing Sometimes, but Useful

One of those visionaries once told us all things in the way of contentment are comparative: The reason it requires a sixteen-pound turkey to satisfy our appetite is not actually that the human stomach requires that quantity to fill it drowsily full, but because the five-dollar-a-week fellow seems able to get along on an eight-pounder. If he would satisfy himself with a sparrow for New Year's, then we could get that same old gluttonous contentment from a ten-week-old gobbler that we once got from the monster.

If this is so, why the long faces in the gas industry? Maybe we are in the years of famine—but, then, look at the electric railways.

All about us the faddists and the demagogues are gloating in their wreckage.

But meanwhile, in consequence, hundreds of thousands of human beings who could afford it if they had to double the fare any electric railway is asking are getting their noses nipped these chill evenings walking homeward for want of the usual means of getting there. And other street railways yet able to hobble along financially, despite the fact that they are running at a loss, are so demoralized in morale at this attitude toward their industry in general that the service they give is little preferable to walking.

And because there is this angle to the situation we are able to discern for utility men a silver lining to the cloud.

Our experimenting mayors are making such a mess of things that citizens in general cannot help but be materially, even to the cursing point, affected.

The specter of municipal ownership has been held over the heads of the utilities almost throughout their existence.

Here and there it has materialized into an actuality, and the experience has been enlightening, if not happy, to the citizens affected.

But never before has operation by politicians approached so close to being a challenge in the ears of citizens as it is to-day.

John Jones, a mile from the railway station and unable to afford a taxicab daily, encounters regularly the cars on his line few and overfilled. Walking is nasty these nipping evenings, but it is better than a fight to get on and a standing fight all the way to his destination to stay there.

He knows the service has gone to pieces; but, encouraging sign, he knows why. The operating company is close to being bankrupt. Only by cutting down thus miserably on its service can it manage to keep going at all.

If John Jones' elected officials truly represented him they would grant the increased fare.

But, happily stupid clowns, they forget times have changed, people think more and are more sophisticated. They prate of being guardians of the people's rights, friends of the poor and protector of their pocketbooks.

Of course, they are digging their own political graves. How could it be otherwise?

But meantime they are doing a service to the utility man. They are taking the dazzle of the municipality's ability to do anything except increase taxes.

From the Journal 60 Years Ago

At Ithaca, N. Y., 3-in. wood tubing, coated inside and outside with coal tar, "are being tried by the Ithaca Gas Works."

The Boston (Mass.) Theater scores a triumph in illumination by means of "a chandelier, 16 ft. in diameter, 24 ft. in height, it weighs 4,000 lb. and has two hundred and forty burners in imitation of candles, arranged in five rows, diminishing in diameter as they descend."

Coal gas evidently had a competitor in the shape of rosin gas, but the Journal, while conceding that an unqualified answer cannot be given to queries of its correspondents, minces no words in standing up for coal gas.

Cleaning Blast Furnace Gas by Electrical Precipitation

(*Continued from page* 48.)

reinforced with two rapping collars located about the one-third and two-third points, approximately. When the hammers are operated by means of levers outside the shell, they are swung to and fro, one at a time, rapping the upper and then the lower collars on these pipes. Each hammer strikes four pipes, alternating, two at a time. Several hammers, about seven or eight, are located on each one of these shafts so that the operator swinging one lever raps as many as twenty or thirty pipes at a time. There are seven levers in all.

Gas Distribution

Ladder work and stair work are suitably placed so that access to the precipitator is easy at all times. A stairway stretches from the operating platform to the precipitators and a gangway from one precipitator to another so that there is no difficulty in getting around. At the top of the precipitators is placed an outlet pipe which carries the gas to the hot stoves and boilers. One precipitator has two inlets three feet in diameter and the other has one inlet four feet in diameter by way of experiment to determine a much discussed point as to whether the question of distribution is a vital one in a precipitator of the closed type. It was the opinion of one of the authors that one inlet was all that was necessary, and this opinion has been fairly well vindicated now that the plant is in operation by the results obtained. It is evident from observations that one inlet is all that is necessary for a precipitator of a closed type, provided its diameter is not too great, as the question of distribution in this type of precipitator is a very small problem. All the doors are of cast iron and are hinged and bolted. Hand holes are placed conveniently. Everything is as gas tight as such work can be made and the leakage from the precipitator proper and its accessories is exceptionally small. In the construction of the plant, both precipitators were started at about the same time and went up from the ground simultaneously. The columns were placed first, the bottom cones were erected and the shell was raised. Difficulty was experienced during erection due to the limited amount of space in which the work had to be done, but patience and co-operation helped along considerably.

The pipes were placed in the shell and all the internal structural work was done before the top cone was put on so that there was no difficulty experienced in the placing of this particular part of the construction. When the top of the precipitators had been finally placed, the piping was started. As this piping was rather large, being six feet in diameter at the top, it was not easy to erect and the work proceeded slowly. The precipitators in their final state were 51½ ft. high from the ground line to the top.

Results Obtained at Dunbar

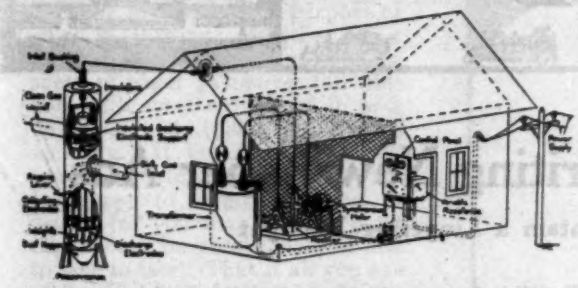
In the short time that the plant at Dunbar has been operated, it has been, of course, difficult to get any data that would be desirable in telling what the precipitators have done. As it is the first installation of its kind in the world, there were many things that needed attention and change, and consequently the effort was concentrated on keeping the precipitators operating at their maximum efficiency rather than in finding out what that maximum efficiency was in actual figures. Visual demonstration, however, was the greatest guide at all times. Dustographs taken by holding a small piece of paper for a stated period of time before the outlet of a small stream of gas impinging on the paper gave a fair indication of what the precipitators did when the current was on and when the current was off. When the current was off, the dust came through the precipitator without being affected at all. The result was that the dust deposited rapidly as gas came through the precipitator without being treated. When the current was put on, the gas impinged against the paper, depositing that dust and fume which got by the cleaning mechanism. Most of the time, this amounted to practically nothing. Dustographs were taken day after day to guide the operators in the results they were getting in the cleaning of the gas. Another visual demonstration that was made was the opening of the doors above the tops of the pipes and allowing the gas to discharge in full force through these doors into the open air with the current off so that no electrical cleaning was taking place. A few moments later, the switch was thrown in and current was put on the precipitator and the photograph was taken of the gas being treated by the electrical current.

Examination of the gas as it burned at the stove and boiler burners showed very effectively that when the current was off a white fumy gas issued through the burners into the stoves and boilers and this gas was so thick that when being burned in the stoves the back of the combustion chambers could not be seen by the observer. As soon as the current was put on the precipitators, the clean up could be immediately noticed; gradually as the observer watched the gas discharge into the inner combustion chamber, it became more and more transparent until the back of the stove combustion chamber could be distinctly seen.

Savings

Of course, concrete results followed such treatment. Previously, from four to six men were constantly used at Dunbar in cleaning the stove wells and combustion chambers and boilers of their dust burden. The dust that was discharged into the stoves very often formed into large masses the size of small boulders and could not be removed from the stoves before being broken up with sledge and bar. This, of course, was expensive work and very often resulted in the destruction of a large amount of brickwork by mechanical hammering. After the precipitators were started in operation, the men were taken off the job and for weeks at a time not a single man was used to clean any of the material from the stoves and boilers because of the entire absence of any dust deposits. It was only after difficulties were encountered with the insulators and the plant was shut down for insulator repairs that dust began to collect in the stoves and boilers again, and men had to be used for cleaning. These troubles were purely mechanical, and could not have been readily foreseen previous to the actual operation of the plant and are now in the process of correction so that when the plant goes back into full operation the only difficulty which was en-

countered in several months of operation at Dunbar will have been eliminated and operation will proceed as before. During the week that the plant operated on ferromanganese gases, perhaps the most difficult of all gases to clean due to its enormously high temperature and its very heavy fume content, the results were even more remarkable than when working on ordinary pig



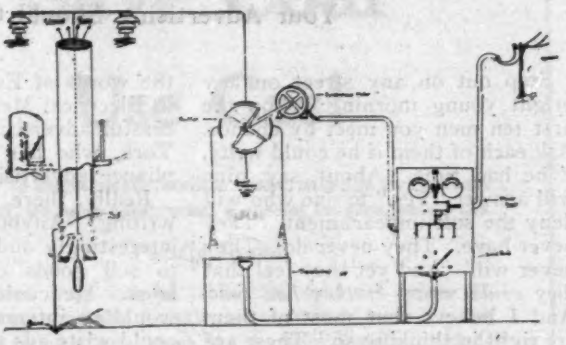
SCHEMATIC LAYOUT FOR ELECTICAL PRECIPITATION INSTALLATION

iron gas. It was not until temperatures had gone up to over 1,100 degrees that the mechanical difficulties mentioned due to insulator trouble began to appear. This, of course, is an abnormal condition and is never met with in the ordinary blast furnace. Before that time, with normal blast furnace operation, the results obtained were remarkable and the operation was smooth, even, and continuous, and gave cleaned gases that had never before been obtained at Dunbar even though several other cleaners had been tried. Notwithstanding the fact that the tremendously high temperature was causing havoc with the insulators, due to their improper placement and position, the precipitators continued to clean the gases of their dust and fume to such a large extent that the production of the furnace went up several tons and the estimates made by the superintendent of the plant indicated that the cost of the plant would be paid for twice over during the year's operation if the precipitators continued to work as they were then working. The distinct advantage of such a result is, of course, apparent without argument. It is fully expected that one of the two units will be converted and with the new changes of insulator placement, successful operation on gases running over 1,000 deg. Fahr. and containing from 8 to 10 grains of dust per cu. ft. with an exceptionally high percentage of potash fume will be accomplished.

By-Products

While the primary purpose of a precipitator is not to collect potash, nevertheless, the potash content of the dust when the ores have any appreciable amount of potash, makes this a valuable by-product. Blast furnaces are usually located near where they can readily dispose of their potash to agricultural communities, and this item alone is sufficient to pay the operating expenses of the plant. These expenses are slight when compared to any other system of cleaning. The power consumption is small. From 15 to 20 KVA is used at Dunbar to clean from 45,000 to 50,000 cu. ft. of gas per minute. One operator is needed during the day and one during the night. Eventually, it is planned to have an automatic mechanical rapping system which will eliminate the need for the present operator helper and make it so that the only thing the operator will have to do is to sit in the electrical house and watch his instruments and control everything from the electrical house. This will eliminate manual labor entirely from the operation of the plant. The dust as it is collected is dumped from the bottom of the hopper, and when it is sold for its potash content is put into cars and shipped away. At Dunbar the potash content of the dust has run from 7 to 9 per cent on pig iron and it is expected that it will run as high as 20 per cent of ferromanganese.

The cleaning results by actual measurement at Dunbar have demonstrated that the electrical precipitation plant can clean gas to less than one-tenth of a grain of dust per cubic foot of gas at standard conditions. This is in excess of what other primary cleaners, either



DIAGRAMMATIC SKETCH OF ELECTRICAL PRECIPITATION

wet or dry, have been able to accomplish. Actual measurements show that the gas at Dunbar was cleaned to .06 grain of dust per cubic foot of gas. While it is not expected that this will be the average condition, still it is expected that at no time will the dust content be over one-tenth of a grain of dust per cubic foot of gas.

Suction Gas for Motor Boats

A vessel equipped with a suction gas plant, said to be the first of her type to cross the Atlantic, has reached Waterford, Ireland. She is a four-masted schooner, *Bessie A. White*, and is fitted with an auxiliary engine, which in this case is a gas engine of 200 h.p., the motive power being suction gas generated on board. The vessel has a net tonnage of 594 tons and is registered Suction Gas For Motor Boats.

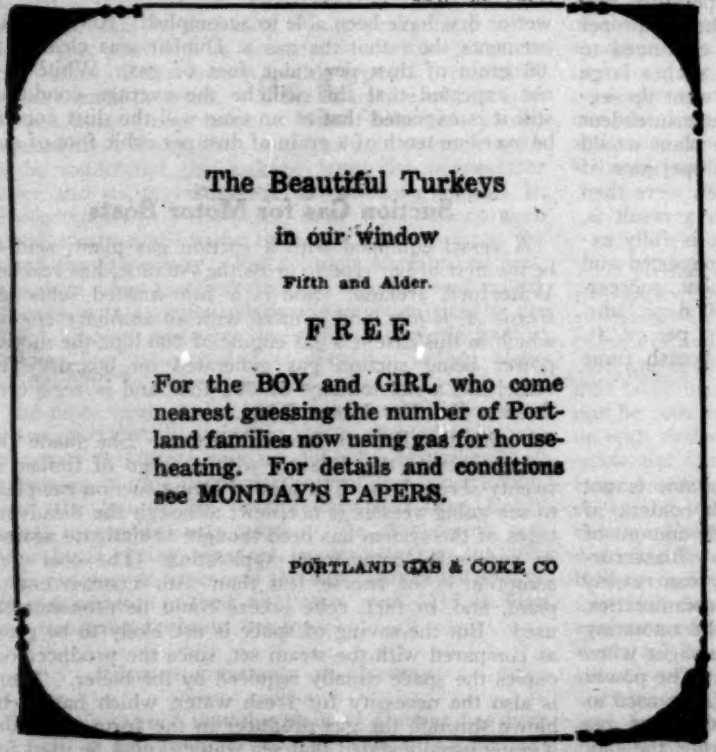
A1 with the French Bureau Veritas. She made the passage across the Atlantic with a cargo of timber in twenty-seven days. The idea of fitting suction gas plant to sea-going vessels is not new, although the disadvantages of the system has been thought to mitigate against its successful commercial application. The coal consumption is, of course, less than with a steam engine plant, and, in fact, coke breeze could be economically used. But the saving of space is not likely to be great as compared with the steam set, since the producer occupies the space usually required by the boiler. There is also the necessity for fresh water, which has to be blown through the gas producer in the form of steam, it being usually stated that sea water cannot be used for this purpose. It is not unlikely that the gas plant contains many innovations as compared with similar installations on land.

The Simple Trick of Writing Newspaper Ads

Your Advertising Should Contain a Lingering Thought

Step out on any street on any bright young morning. Stop the first ten men you meet by chance. Ask each of them if he could write, if he had time. About, say, nine will answer "Yes," to one who will deny the soft impeachment. They never have. They never do. They never will. And yet they feel that they *could* write—*if they had time.* And I believe that most of them are right in thinking so. These are the words of Earl E. Whitehorne, in Electrical Merchandising, a successful advertising expert of New York, who has specialized in appliance advertising.

Really, there is no big trick to writing. Anybody who can talk interestingly and has guts enough to sell goods could write if he tried. He could write stuff that would be interesting to read. He could write ads that would pull—if he could just line up his mental attitude in a way that always seems to me quite simple. Of course, he wouldn't be a great writer, any more than a great speaker. He wouldn't be a leader among advertising men. For that sort of thing comes like your red hair, or your beautiful eyes. You have it or you have it not. And there is no more use in trying to coax out literary genius than to water a bald head and hope for curls. But if you can just get the point o' view that *when you write you are only talking,* and that the purpose is only to tell somebody something in a few easy words, I'll bet that with a little practice you could do it.


The Beautiful Turkeys
in our window
Fifth and Alder.
FREE
For the BOY and GIRL who come nearest guessing the number of Portland families now using gas for house-heating. For details and conditions see MONDAY'S PAPERS.
PORTLAND GAS & COKE CO

AN ADVERTISEMENT BY JOHN H. HARTOG, OF THE PORTLAND (ORE.) GAS & COKE COMPANY. THIS IS A GOOD EXAMPLE OF THE PERSONAL IDEA

Now, I am an advertising man myself and a sort of a writer. People pay me real money for doing their writing for them. And yet I know that many of these people could do it just as well themselves with a little effort and a bit of practice, but for this almost universal kink in their point o' view. Their minds are all made up that they haven't time to write, and therefore that they can't. The result is that when they *do* try to write an ad it is a failure. And for this same reason hundreds of companies who ought to be advertising gas appliances to the local people all the time are not advertising at all. And hundreds more are writing barren ads that have no chance to pay a profit.

I want to point out, if I can, how they can write their local ads themselves and make them good, and do it easily. I'm not afraid to open up and spread this secret out where customers of mine can see it—because I know that they will go

right on believing they're too busy and imagining I have got some trick that makes my writing better, anyway. So the wolf will keep his regular distance, just the same.

The Clear-Cut Purpose

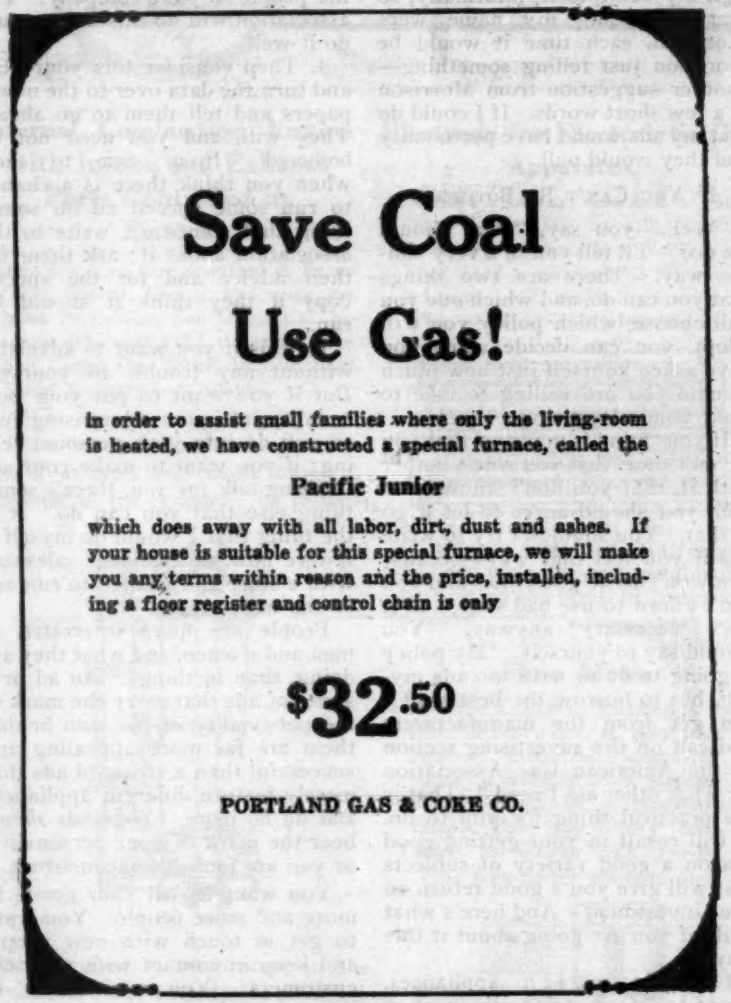
In the first place, the purpose of an ad is clear-cut. Whether it is a newspaper ad, a selling letter, a sheet of paper pasted on the window with some writing on it, or a well-done little folder, it is just a message. It is supposed to tell somebody something, that's all. It's supposed to go and speak to people for you that you can't get time to call on personally and talk to face to face. That is all you ask of it. If it will do that much it is enough.

Of course, the best way to sell goods is to go sell 'em. No advertising in the world is half as good as talking. When you talk you have a chance to impress your prospect with your own enthusiasm, confidence and good judgment.

You tell 'em. They listen. And the influence of your message and your personality convinces and sells. And there you have the combination that has got to be in every ad to give it power to interest, influence and sell—*message and personality*. I mean *your* message and *your* personality, expressed in ads that read as though you yourself were saying something. There is the simple secret of it. There's the whole trick.

Now, to boil it down and cut a long tale short we'll just consider the company and its newspaper ad. For this is the first kind of advertising it should and will do. There is the appliance salesroom. In it are goods to sell. When people drop in the salesman talks to them about these goods and shows them why and how and how much, and he makes sales. But enough people won't come in of themselves, so you feel compelled to *go to* the rest and tell them anyhow. So, as there isn't time enough to call on every household or on any smaller number of households often enough, you see that a message must be sent. The newspaper offers to carry this message for you to almost every home. You decide that this will be the easiest and cheapest way, and so you make a dicker for some space—so big an ad so often.

All right. What are you going to do with this space now that you have it? What are you going to say? Ten chances to one you will first take your local paper and look through the other ads and decide that the way to do it is to sort of copy them, fixing up displays of type like theirs about your goods. You'll start this way, taking suggestions from the man who comes to see you from the newspaper, insisting only that you are to have "something different" all the time. And you'll run along this way until you get tired of it, because you don't seem to be saying anything much in these ads of yours or getting anywhere. And the first thing you know you quit your regular advertising and just go in now and then when somebody goads you into it. Your experience with advertising has not been interesting or profitable. You have tried to sell goods without really trying and it won't work.


Save Coal
Use Gas!
In order to assist small families where only the living-room is heated, we have constructed a special furnace, called the
Pacific Junior
which does away with all labor, dirt, dust and ashes. If your house is suitable for this special furnace, we will make you any terms within reason and the price, installed, including a floor register and control chain is only
$32.50
PORTLAND GAS & COKE CO.

ANOTHER ADVERTISEMENT BY JOHN H. HARTOG, OF THE PORTLAND (ORE.) COMPANY, WHICH EXHIBITS THE "LINGERING THOUGHT"—SAVE COAL, USE GAS!

The Lingering Thought

No speaker, no salesman, no good preacher expects the audience or the customer to remember all he says. He hammers in the facts and figures to build up a case and win conviction, but the message is always, after all, just a lingering thought, something he wants you to remember. He tries to leave this lingering thought behind him, and so should every ad. Lots of words and a balanced display of different sized type are not worth

anything if there is not a lingering thought—one lingering thought. I would try to make each ad tell something, give one good suggestion that would stick and be remembered for a while. I would sign my name to it, informally, so that, supposing my name were Morrison, each time it would be Morrison just telling something—another suggestion from Morrison in a few short words. If I could do that my ads would have personality and they would pull.

If You Can't Be Bothered

"Well," you say, "what should we do?" I'll tell you in a very simple way. There are two things that you can do, and which one you will choose, which policy you will adopt, you can decide when you have asked yourself just how much trouble you are willing to take to make your advertising a success.

If your mind is made up that you haven't time, that you won't bother with it, that you don't know how, then you should agree to let it go at that. You shouldn't try to write ads if you feel that way—because you won't write good ones and you can't afford to use bad ones, and it isn't necessary anyway. You should say to yourself: "My policy is going to be to write no ads myself, but to borrow the best stuff I can get from the manufacturers and call on the advertising section of the American Gas Association for what other aid I need." That is the practical thing for you to do. It will result in your getting good ads on a good variety of subjects that will give you a good return on your investment. And here's what to do if you are going about it this way:

1. Decide which appliances, lamps and accessories you want to push.

2. Write to the manufacturers of these devices and tell them what you are going to do, how much space you are going to use, how often, how long, and just what you mean to feature. Ask them for electrotypes of the best ads they have to fit your need and opportunity. Their advertising men will have better judgment than you will. Let them advise you.

3. When the stuff comes in take proofs of it and send them to the advertising section of the American Gas Association. Join if you are not already a member. Ask them to tell you which ads to run first and in what order. Ask them to write for you the other ads you need about good service and the other subjects that you should touch on in keeping your message before the public and interesting the people in your company. The association will do this for you and do it well.

4. Then consider this your plan and turn the data over to the newspapers and tell them to go ahead. They will, and you need not be bothered. From time to time, when you think there is a chance to run some special ad on something that comes up, write to the association about it; ask them for their advice and for the special copy if they think it should be run.

Do this if you want to advertise without any trouble to yourself. But if you want to put your personality into your advertising just as you do into your personal selling; if you want to make your advertising talk *for you*, there's something else that you can do. It is the thing that I would do myself if I were now an appliance salesman with a store and wanted to run ads in the newspaper.

People are more interested in men and women, and what they are doing, than in things. An ad or a series of ads that carry the mark of the personality of the man behind them are far more appealing and successful than a string of ads that merely feature different appliances and do no more. Your ads *should* bear the mark of your personality, or you are foolishly inconsistent.

You want to sell your goods to more and more people. You want to get in touch with new people and keep in contact with your old customers. You want them to know your showroom and where it is and what it offers them. You want them to know you personally. When they come in you like to talk to them. When you call on a customer at his home you send in your own card; you wear no green whiskers or other disguise. You carry your own personality with you everywhere, and you are always the same man, in your showroom or on the street. Then, why not be the same man in your newspaper ad? Why not?

Some people want their ads to be always different—but they don't feel compelled to keep painting their store front some different color all the time, or moving it to some other street, or wearing different kinds of clothes, or talking first falsetto and then like a frog. They don't walk into your house first on their feet and next on their hands and knees. It wouldn't be natural. It wouldn't be consistent. It wouldn't be *you*—your personality—the character and individuality that people get acquainted with and know. The man, the store and the ad must be interesting—yes—but it need not strain itself to be different. What's the use? What's the purpose? It's better just to be yourself and do your best.

Therefore, I think a man should have his ads talk like himself, talk *his talk* in the paper for himself and mark his ads with that same personality that marks him when he talks to these same people face to face. And so, when you decide to advertise and sit down and list the things that you would like to feature—to talk about—just do that thing—talk about them in the paper. Write to the manufacturers for some good small line cuts of the appliances. Write to the association for some good small cuts to use as pictures, illustrations that will catch the eye and make the ad look brighter—say, a woman sitting reading under a portable gas lamp, or a man warming his feet at a Radiantfire, or any picture that will tie into a gas-log ad, or what you will. You know exactly what I mean and so will the association when you write to them. Then, when you get these cuts together just begin and talk short messages in your own words the way you naturally would talk if you wanted to speak a message to somebody and could only say a little bit. Sign it with your name, either the manager's or one of the salesmen's.

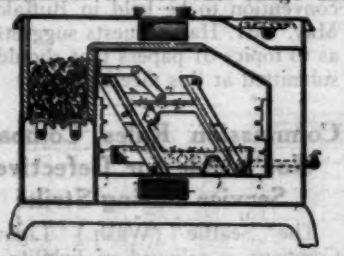
I would try to write these ads informally, just as I talk. I would try to get them in the paper at the right time, something to fit cold spells, hot spells, dry spells, wet spells, before holiday, or to tie in with any other thing that will add human interest to the message. I would try to talk my talk, just a look different. I would use different cuts, however, to make the picture catch the eye. I would run other ads when I felt like it, manufacturers' ads on any appliance I wanted to play up, but always I would try to talk my talk, just a simple, straightforward message with a lingering thought in it. That's what counts.

PATENTS PERTINENT TO GAS INDUSTRY

Convertible Gas-Burning Oven

Patent No. 1,325,767; described in Patent Office *Gazette*, Dec. 23, 1919, page 601. Albert H. Tinnerman, Cleveland, Ohio. Filed Feb. 20, 1915. Serial No. 9,553. 15 Claims. (Cl. 126—36.)

This convertible gas-burning oven consists of a solid fuel range and



an oven which has a converting gas-burning member that is adapted to be inserted and removed from the oven. The gas burner has an apertured air-distributing plate which is positioned above the oven bottom. There is also a gas and air mixer connection which extends to the oven. The oven also has an air duct, positioned above its bottom, with a vent to the chimney stack. There is a means for closing each. This means for closing is controlled automatically by the movement of the gas burner.

Production of Ammonium Sulphate

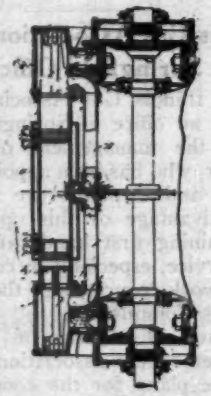
Patent No 1,325,605; described in Patent Office *Gazette*, Dec. 23, 1919, page 571. Clement W. Bailey, Harry S. Denny, and William H. H. Norris, Langwith, England. Filed Dec. 2, 1918. Serial No. 265,000. 2 Claims. (Cl. 23—21.)

This process of producing ammonium sulphate from gases containing ammonia consists in bringing together niter cake, ammonium sulphate and sodium sulphate in the presence of water, and separating out a proportion of the sodium sulphate and employing the resultant solution, without the addition of acid, for absorbing the gaseous ammonia.

Internal Combustion Engine with Intake and Exhaust Ports Controlled by Pistons

Patent No. 1,324,520; described in Patent Office *Gazette*, Dec. 9, 1919, page 291. Nova B. Robbins, San Diego, Cal., assignor to himself and J. Grant Ambrose, San Diego, Cal. Filed May 10, 1918. Serial No. 233,700. 5 Claims. (Cl. 123—51.)

This internal combustion engine has a cylinder and crank cases at the ends of the cylinder. Its pistons

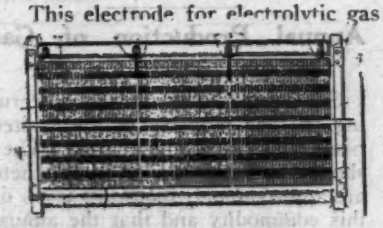


are mounted to reciprocate in the cylinder. The cylinder is provided, adjacent its ends, with intake and exhaust ports that are controlled by the pistons. When the pistons are retracted, the exhaust ports open, and the intake ports open to establish communication with the crank cases by way of the ends of the cylinders when the pistons are advanced. A conduit, which has an outlet communicating with the cylinder between the pistons, connects the crank cases. There is also a driven member, and a means for connecting this driven member with the pistons. There is also a means, which is actuated by the driven member, for operating the valve.

Electrode for Electrolytic Gas Apparatus

Patent No. 1,326,134; described in Patent Office *Gazette*, Dec. 23, 1919, page 669. Ralph D. Mershon, New York, N. Y. Filed April 2, 1917. Serial No. 159,146. 8 Claims. (Cl. 204—4.)

This electrode for electrolytic gas

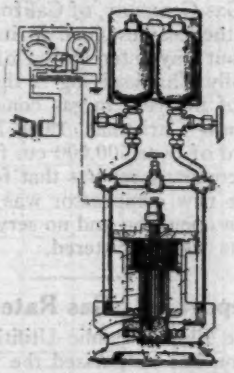


apparatus is composed of a crimped, or folded plate, of sheet metal having apertures in the bends of the crimps, or folds.

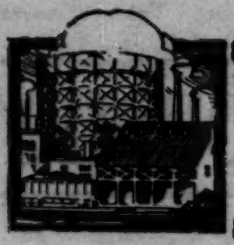
Flow Meter

Patent No. 1,325,763; described in Patent Office *Gazette*, Dec. 23, 1919, page 600. Jacob M. Spitzglass, Chicago, Ill., assignor to Republic Flow Meters Company, Chicago, Ill., a corporation of Illinois. Filed May 19, 1915. Serial No. 29,063. 10 Claims. (Cl. 177—351.)

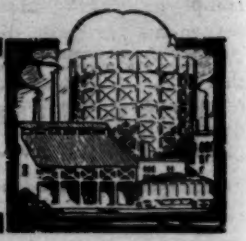
This flow meter consists of a cas-



ing formed with two chambers, one directly above the other. There is a well which is formed by a shell extending between and into each of these two chambers. Different liquid flows for each of the two chambers and the well.



NEWS OF THE GAS INDUSTRY



Consolidation Announcement

Announcement has been made that the Framingham Gas, Fuel & Power Company, of Framingham, Mass., and the Natick Gas Light Company of Natick, Mass., have consolidated with the West Boston (Mass.) Gas Company, as of Dec. 31, 1919.

Annual Production of Gas 327,000,000,000 Cu. Ft.

Some interesting figures concerning the gas industry in the United States have been made public. They show that in the United States there are approximately 8,500,000 users of this commodity and that the annual production is around 327,000,000,000 cu. ft. It is estimated that the 8,500,000 users above mentioned represent something like half of the families in the United States, thus showing that the whole population is dependent in a very large measure upon gas in their daily lives.

Central Counties Company Carries Record Load in Its History

Christmas day the Central Counties Gas Company, of California, carried the heaviest load in its history, without any interruption of service. Usually Thanksgiving is the biggest day of the year in gas consumption, but now Christmas, 1919, holds the record of over 500,000 cu. ft. of gas. The company reports that fortunately the new compressor was installed and in operation and no service complaints were registered.

Freeport, Ill., Gas Rate Raised

The Illinois Public Utilities Commission has authorized the Freeport Gas Company to increase its rates. Under the new schedule the rates are $1.45 gross and $1.35 net per 1,000 cu. ft. used per month. The present gross rate is $1.10. The company asked for a rate of $1.52 per 1,000 cu. ft.

A. G. A. Committee Will Study Conditions in Gas Lighting Field

The committee on gas lighting of the American Gas Association will undertake a careful study of present conditions in the gas lighting field and an analysis of the business now held by various companies, looking toward definite recommendations of ways and means for increasing and retaining installations and sales of gas for illumination. The committee will co-operate with manufacturers of gas lighting equipment for improving the efficiency and the artstic qualities of fixtures.

Illinois Gas Association Opens Springfield Office

The Illinois Gas Association has opened an office in Springfield, Ill., under the management of R. V. Prather, who has been appointed secretary, and members are urged to take advantage of this opportunity in obtaining first hand information and service, especially in connection with work concerning the Public Utilities Commission.

Horace H. Clark, of Chicago, treasurer of the association, reports that the plans for the coming Sixteenth Annual Convention on March 17 and 18, are practically completed. Mr. Clark further reports that the foremost manufacturers in the industry are prepared to exhibit their latest appliances, and to show all their newest improvements, quote prices and deliveries, and in other ways assist the industry in its prosperity during this convention. There are still a few spaces left, and manufacturers wishing to exhibit are urged to make reservations as soon as possible.

Every member of the association is also urged to make arrangements now to be present and to invite as many of his friends and associates to attend as is possible, as it is expected that this will be the biggest and best convention ever held by the Illinois Gas Association.

Natural Gas Association Solicits Suggestions for Its Convention

William B. Hay, secretary of the Natural Gas Association of America, announces that the board of directors of the association will hold a meeting on the 26th of January to take up the matter of papers for the next convention to be held in Buffalo in May. Mr. Hay requests suggestions as to topics of papers that should be submitted at this meeting.

Commission Rules Company Not Liable for Defective Service During Strike

The Seattle (Wash.) Lighting Company is relieved of liability for reparation to consumers for shortage of gas during the strike of company employees last September by a ruling of the State of Washington Public Service Commission.

In announcing its finding, the commission asserts its authority to order reparation to consumers in proper cases, but holds the lighting company made every effort to remedy defects in service resulting from the strike.

The commission cites the correct rule to be that where the defect is not due to neglect, violation of law or disobedience to orders of the public service commission, reparation should be limited to refunds for actual overcharges. In case of the inadequate service during the strike the commission holds that there is no evidence of neglect of violation of the law, and finds that the measurements to consumers was substantially accurate and that they paid for no more than was actually consumed.

The reduction in collections for the period mentioned in the complaint filed by the city, was almost in exact ratio with reductions in gas output, the commission finds from the evidence.

The finding by the commission is supplemental to its order based upon a hearing held Oct. 3, in Seattle, on

complaint filed by the city alleging inadequate service in the gas supply. At that time no finding was made on the matter of reparation and the gas company contended that there was no question of reparation involved in the case.

Comparison of gas consumption for the months of September and October in the years 1918 and 1919 discloses that during the period complained of the consumption was 26,255 cu. ft. less than it would have been under normal conditions. Collections for this period show a corresponding decrease. Significance attached by the commission to the small number of individual complaints as to excessive bills.

In reviewing its finding the commission says: "We are not prepared to hold that a strike will in every instance excuse a utility for defective service. Neither are we inclined to establish the precedent under which dissatisfied employees may cripple a public service and simultaneously use the commission as a club on the back of a utility already staggering under a blow which they themselves have dealt. We are not charging that such object was sought in this case but any decision based upon principles that would tend to encourage use of such double weapon would be dangerous and unsound. We are not prepared to hold that a reparation order in the nature of penalty or in lieu of a fine would be valid under our statute."

Accompanying Table Shows Capacity of Tanks Laid Flat per Inch

The accompanying schedule will be of interest to the gas industry in connection with estimating the contents of oil storage tanks, etc. For instance, if a tank 6 ft. in diameter and 30 in. long is found to be half full or to contain 36 in. of oil or liquor, reference to the table shows the number of gallons per inch in length to be 8.81, which multiplied by the length of the tank in inches (360) gives a total of 3,171.6 gallons.

While the table covers tanks of usual diameters, it can be used in approximating contents of intermediate sizes.

CAPACITY OF ROUND TANKS LAID FLAT.
PREPARED BY THE
RUSSELL ENGINEERING CO.
ST. LOUIS, MO.

Height above Bottom in Inches	Diameter of Tank.											Height above Bottom in Inches	Diameter of Tank.							
	40"	54"	60"	66"	72"	78"	84"	90"	96"	108"	120"		66"	72"	78"	84"	90"	96"	108"	120"
1	.04	.043	.045	.047	.05	.051	.053	.055	.056	.057	.06	61	14.31	15.92	17.35	18.67	19.87	20.99	23.09	25.00
2	.11	.12	.125	.13	.14	.14	.15	.15	.15	.171	.18	62	14.45	16.14	17.65	18.99	20.23	21.39	23.55	25.52
3	.20	.22	.23	.24	.25	.26	.27	.28	.28	.313	.32	63	14.58	16.35	17.90	19.31	20.59	21.79	24.01	26.04
4	.31	.35	.38	.37	.39	.40	.42	.43	.45	.475	.50	64	14.69	16.55	18.16	19.62	20.95	22.19	24.47	26.56
5	.43	.46	.49	.51	.54	.56	.58	.60	.63	.657	.70	65	14.77	16.74	18.41	19.93	21.30	22.56	24.93	27.08
6	.56	.60	.64	.67	.70	.73	.76	.79	.82	.854	.92	66	14.81	16.92	18.66	20.23	21.65	22.97	25.39	27.60
7	.71	.75	.80	.84	.88	.92	.95	.99	1.02	1.09	1.15	67		17.06	18.90	20.52	21.99	23.35	25.85	28.12
8	.86	.91	.97	1.02	1.07	1.12	1.16	1.20	1.24	1.33	1.40	68		17.23	19.13	20.81	22.33	23.73	26.30	28.65
9	1.02	1.08	1.15	1.21	1.27	1.33	1.38	1.43	1.48	1.59	1.67	69		17.37	19.35	21.09	22.66	24.10	26.75	29.14
10	1.18	1.26	1.34	1.41	1.48	1.55	1.61	1.67	1.73	1.86	1.95	70		17.48	19.56	21.37	22.99	24.47	27.20	29.65
11	1.35	1.44	1.54	1.62	1.70	1.78	1.85	1.92	1.99	2.13	2.24	71		17.57	19.76	21.64	23.31	24.84	27.64	30.16
12	1.53	1.63	1.74	1.84	1.93	2.02	2.10	2.18	2.26	2.41	2.53	72		17.62	19.95	21.90	23.62	25.20	28.06	30.67
13	1.71	1.82	1.93	2.06	2.17	2.27	2.36	2.45	2.54	2.70	2.87	73			20.12	22.15	23.93	25.56	28.52	31.18
14	1.90	2.02	2.17	2.29	2.41	2.52	2.63	2.73	2.83	3.01	3.20	74			20.26	22.39	24.23	25.91	28.96	31.69
15	2.09	2.23	2.39	2.53	2.66	2.78	2.91	3.02	3.13	3.33	3.53	75			20.42	22.62	24.52	26.26	29.39	32.19
16	2.28	2.43	2.62	2.77	2.92	3.05	3.19	3.31	3.43	3.66	3.88	76			20.54	22.84	24.81	26.60	29.82	32.69
17	2.48	2.77	2.85	3.02	3.18	3.33	3.48	3.61	3.74	4.00	4.24	77			20.63	23.05	25.09	26.94	30.25	33.19
18	2.66	2.89	3.09	3.27	3.45	3.61	3.77	3.92	4.06	4.34	4.61	78			20.69	23.24	25.36	27.27	30.67	33.69
19	2.86	3.11	3.33	3.53	3.72	3.9	4.07	4.23	4.39	4.70	4.98	79				23.42	25.62	27.59	31.09	34.16
20	3.06	3.33	3.57	3.79	4.00	4.19	4.38	4.55	4.73	5.06	5.36	80				23.58	25.87	27.90	31.50	34.67
21	3.29	3.58	3.82	4.05	4.28	4.49	4.69	4.88	5.07	5.43	5.75	81				23.75	26.11	28.20	31.91	35.16
22	3.50	3.78	4.07	4.32	4.56	4.79	5.01	5.21	5.42	5.81	6.15	82				23.86	26.33	28.50	32.31	35.65
23	3.71	4.01	4.32	4.59	4.85	5.10	5.33	5.55	5.77	6.19	6.56	83				23.95	26.54	28.79	32.70	36.13
24	3.92	4.24	4.57	4.86	5.14	5.41	5.66	5.89	6.13	6.57	6.97	84				24.00	26.74	29.07	33.09	36.61
25	4.13	4.46	4.82	5.14	5.43	5.72	5.99	6.24	6.49	6.96	7.39	85					26.93	29.34	33.47	37.08
26	4.34	4.72	5.06	5.42	5.73	6.04	6.33	6.59	6.86	7.35	7.82	86					27.10	29.60	33.85	37.55
27	4.55	4.96	5.34	5.70	6.03	6.36	6.66	6.95	7.23	7.75	8.23	87					27.25	29.85	34.23	38.01
28	4.76	5.20	5.60	5.98	6.33	6.68	7.00	7.31	7.60	8.16	8.69	88					27.39	30.09	34.60	38.47
29	4.96	5.44	5.86	6.26	6.64	7.00	7.34	7.67	7.98	8.57	9.13	89					27.49	30.31	34.96	38.93
30	5.16	5.68	6.12	6.54	6.95	7.35	7.69	8.04	8.36	8.99	9.58	90					27.54	30.51	35.32	39.38
31	5.36	5.91	6.38	6.85	7.28	7.66	8.04	8.41	8.75	9.41	10.03	91						30.70	35.66	39.83
32	5.56	6.14	6.64	7.12	7.57	7.99	8.39	8.78	9.14	9.84	10.49	92						30.88	36.00	40.27
33	5.75	6.37	6.90	7.41	7.88	8.32	8.74	9.15	9.54	10.27	10.96	93						31.05	36.35	40.71
34	5.94	6.59	7.16	7.70	8.19	8.65	9.10	9.53	9.94	10.70	11.41	94						31.19	36.65	41.14
35	6.13	6.81	7.42	7.99	8.50	8.98	9.46	9.91	10.34	11.14	11.88	95						31.29	36.96	41.57
36	6.31	7.03	7.67	8.28	8.81	9.32	9.82	10.29	10.74	11.56	12.35	96						31.34	37.25	41.99
37	6.49	7.25	7.92	8.56	9.12	9.66	10.18	10.67	11.14	12.02	12.85	97							37.55	42.40
38	6.66	7.47	8.17	8.84	9.45	10.00	10.54	11.05	11.54	12.46	13.31	98							37.80	42.81
39	6.82	7.69	8.42	9.12	9.74	10.34	10.90	11.45	11.95	12.91	13.80	99							38.07	43.21
40	6.98	7.90	8.67	9.40	10.05	10.68	11.26	11.82	12.36	13.36	14.29	100							38.35	43.60
41	7.15	8.10	8.91	9.66	10.36	11.02	11.63	12.21	12.77	13.81	14.78	101							38.57	43.98
42	7.28	8.29	9.15	9.96	10.67	11.36	12.00	12.60	13.18	14.27	15.27	102							38.81	44.35
43	7.41	8.46	9.39	10.23	10.98	11.70	12.37	12.99	13.59	14.75	15.77	103							39.01	44.72
44	7.55	8.66	9.62	10.50	11.29	12.03	12.74	13.36	14.01	15.19	16.27	104							39.19	45.06
45	7.64	8.84	9.85	10.77	11.59	12.36	13.10	13.77	14.42	15.65	16.77	105							39.35	45.43
46	7.73	9.01	10.07	11.05	11.89	12.69	13.46	14.16	14.83	16.11	17.27	106							39.49	45.76
47	7.80	9.17	10.29	11.29	12.19	13.02	13.82	14.55	15.25	16.57	17.78	107							39.60	46.09
48	7.84	9.32	10.50	11.55	12.46	13.35	14.16	14.94	15.67	17.05	18.29	108							39.66	46.41
49		9.46	10.70	11.80	12.77	13.68	14.54	15.35	16.09	17.49	18.80	109								46.72
50		9.59	10.90	12.06	13.06	14.00	14.90	15.72	16.51	17.95	19.31	110								47.01
51		9.70	11.09	12.29	13.34	14.32	15.26	16.11	16.92	18.42	19.82	111								47.29
52		9.80	11.27	12.55	13.62	14.64	15.61	16.49	17.33	18.89	20.33	112								47.56
53		9.88	11.44	12.76	13.90	14.96	15.96	16.87	17.74	19.36	20.84	113								47.81
54		9.92	11.60	12.98	14.17	15.27	16.31	17.25	18.15	19.83	21.36	114								48.04
55			11.75	13.20	14.44	15.58	16.66	17.63	18.56	20.30	21.88	115								48.26
56			11.89	13.41	14.70	15.89	17.00	18.01	18.97	20.77	22.40	116								48.46
57			12.01	13.61	14.96	16.19	17.34	18.39	19.38	21.24	22.92	117								48.64
58			12.12	13.80	15.21	16.49	17.66	18.76	19.79	21.71	23.44	118								48.78
59			12.20	13.98	15.45	16.78	18.01	19.13	20.19	22.17	23.96	119								48.90
60			12.24	14.15	15.69	17.07	18.34	19.50	20.59	22.63	24.45	120								48.98

Capacity in Gallons per inch in Height from Bottom per inch in Length of Tank.
To secure total volume in Tank, multiply by length of Tank in inches.

TABULATION SHOWING THE ESTIMATED CONTENTS AND CAPACITY IN GALLONS OF VARIOUS SIZED OIL STORAGE TANKS

"Poor Man's Well" Production Estimated at 20,000,000 Cu. Ft.

The Dutcher gas well No. 1 in the McKeesport field of Pennsylvania, brought in with an estimated daily production of 20,000,000 cu. ft., is reported to have caught fire from some undetermined cause. The gusher, known as the "Poor Man's Well" because the 850 stockholders are persons in moderate circumstances, came in with a roar. Experts said the production would measure about 20,000,000 cu. ft.

Workers had made all connections and were ready to turn the flow in a main when the fire started. The well is located 100 ft. from the 25,000,000 cu. ft. gusher which was afire for three days.

Worcester Company Starts Inspection of All Gas Appliances in Use

The Worcester Gas Light Company has begun a systematized inspection of the gas appliances which it supplies with gas. The work cannot be done all at once, but the beginning has been made and inspection will proceed rapidly as soon as complete organization for the purpose has been made.

The first step is the inspecting of the automatic type gas water heaters, of which there are 300 in the city.

Each day Manager C. E. Paige sends a letter to a group of owners of these heaters, of a number no greater than can be covered by inspectors in three days, notifying them of the proposed call and inviting information as to troubles with the heaters.

An inspector calls at each of these places, goes over the heater and leaves it in the best possible condition, together with such instructions as to its use as may be necessary. In a short time this type of appliance will have been cleaned up, and Mr. Paige proposes to pass on to another type.

This plan of inspection is the practice of C. H. Tenney & Co., the operating managers of the Worcester plant, with all its gas properties. The idea is to keep every appliance in as perfect condition as feasible. This will include the 5,000 gas heaters of the ordinary type, the gas ranges, and burners of all other descriptions.

New Gas Plant at Baton Rouge in Operation

The new gas plant at Baton Rouge, La., which has been under course of construction for the past six months, has been completed, and H. Vittinghoff, of Boston, Mass., head of the gas department of Stone & Webster Company, is in Baton Rouge giving a final inspection to the work that has been done. The new addition to the gas plant is a water gas set, which doubles the capacity of the plant.

New York Consolidated Bonds Go Well

The $25,000,000 of 5-year 7 per cent bonds of the Consolidated Gas Company of New York have been in such demand from the stockholders that little, if any, of the issue will remain to be offered to the public after the allotments are made. Stockholders were given the right to subscribe to the issue at par to the extent of 25 per cent of their holdings, with the privilege of purchasing whatever balance there might be. Judging from reports, they have taken full advantage of the opportunity presented.

Gas Engineers Talk to Providence Engineering Society

F. C. Freeman, engineer of the Providence (R. I.) Gas Company, and E. H. Bauer, engineer of manufacturing for the same company, gave talks on the evening of Jan. 6 to the members of the Providence Engineering Society. The presiding officer of the evening was the engineer of the Rhode Island Public Utilities Commission.

Mr. Freeman covered the subject of carbureted water gas and oil gas, explaining every step from the fuel pile to the storage holder, illustrating his talk with numerous lantern slides and photographs.

Mr. Bauer followed Mr. Freeman and covered the subject of coal gas dealing with the grade of coal necessary and showing lantern slides of different types of retorts from beehive ovens to by-product coke ovens.

The audience was composed of engineers in various lines in the city of Providence, and there was an agreement of opinion that the talks resulted in giving these men a better understanding of the problems of a gas company.

City Offers Gas Pipe for Sale

The city of Muskogee, Okla., is about to offer for sale about 45,000 ft. of gas pipe used in the municipal gas line which was abandoned over a year ago when the supply east of the city failed. The pipe will bring about 65 cents a ft. in the ground, it is believed, as pipe prices have gone up in the last year or two.

Strike in Albany's Municipal Gas Plant—Officials Deny Workers' Demands

Refusal of the officials of the Municipal Gas Company to accept the new working agreement submitted by the workers in the Albany municipal gas plant, which featured a request for a wage increase of $1 a day, was followed by a strike of more than eighty-five employees. As yet the strike has resulted in no interruption of the service furnished the city, but if it continues any length of time curtailment and possibly suspension may result.

Carl H. Graf, vice-president and general manager of the gas company, notified the officials of the workers' union that the new agreement submitted some weeks ago was not acceptable. He set a day giving the workmen time to submit their answer to his ultimatum and the result was a strike of workmen in other departments, all of whom are affiliated with the union.

All the employees of the company, with the exception of one department were out Monday night, Dec. 29, but the men who direct the city's lighting system remained at their posts under an understanding with the strikers. The engineers and firemen also remained on duty, but in all probability they will be called out.

The gas company officials have made arrangements to maintain service in the event the strike continues any length of time. A force of watchmen have been placed on duty to guard against any violent demonstration on the part of the strikers that might seriously interfere with the city's lighting system.

It is not expected a demonstration of that nature will be forthcoming, as union officials have declared there will be absolutely no violence. In addition to the $1 a day increase the new agreement asks for triple pay for holiday and overtime work and several minor concessions to the employees.

Plans of the Heating Committee of A. G. A.

The Heating Committee of the American Gas Association reports that the collection of data on gas heating installations and on conditions which affect the heating load is to be followed up by an analysis of all information secured. The committee will also consider such subjects as rating of gas-fired house heating boilers, gas-fired steam radiators and relations between gas companies and steamfitters.

It has been suggested that this committee also report on the large storage hot water supply systems since these are usually taken care of by the men who look after the house heating business.

Personal Notes

GEORGE W. ALLEN, of the Consumers Gas Company, of Toronto, Canada, who is the secretary-treasurer of the Canadian Gas Association, has been appointed treasurer of the newly organized Employment Managers' Association of Toronto. This association has been formed for the purpose of studying industrial problems on a practical basis from the viewpoint of the employee as well as the employer and executive. Most of Mr. Allen's work has been along the lines of employment, and employee and welfare problems.

L. J. NOBLE has been appointed general superintendent of the Gas, Electric and Street Railway departments of the Fort Smith Light & Traction Company, Fort Smith, Ark.

J. H. EUSTACE, for many years chief gas engineer of the Peoples Gas Light & Coke Company, of Chicago, has succeeded John Williamson in charge of engineering and production.

THOMAS F. WICKHAM, secretary and treasurer of the Union Gas & Electric Company, of Cincinnati, O., and also secretary and treasurer of the Columbia Gas & Electric Company, of Huntington, W. Va., for the past five years, has resigned to assume a position with A. B. Leach & Co., bankers, in Chicago.

F. H. HAWKINS has been appointed general superintendent of the Orange County Public Service Corporation of Middletown, N. Y., and has already assumed his new duties. Previous to this appointment Mr. Hawkins was works superintendent of the Plymouth (Mass.) Gas Light Company.

WILLIAM R. CONARD and J. STEWART BUZBY have formed a partnership under the firm name of Conard & Buzby. Their business will comprise the inspection and tests of materials, with especial relation to gas works and water works supplies, and also reports, specifications, designs and general engineering.

Changes in Personnel of Oklahoma Gas & Electric Company

W. R. Molinard, vice-president in charge of operation of the Oklahoma Gas & Electric Company, has resigned and will be succeeded by H. W. Reilly, heretofore superintendent of construction for the Oklahoma properties. H. W. Graeber, assistant superintendent of construction, now becomes superintendent. The changes take effect Jan. 1. Mr. Molinard will go to California on account of private interests there. He has been connected with the Byllesby organization in important capacities since 1912.

John Williamson, Vice-President of Chicago Company, Resigns

John Williamson, for many years vice-president of the Peoples Gas Light & Coke Company, of Chicago, in charge of the engineering and production side of the company's business, has resigned and retired from active business.

Mr. Williamson has been identified with the gas industry almost from the day he arrived in this country from Scotland nearly fifty years ago —first in Brooklyn and then in Chicago. He came here thirty-three years ago as foreman of one of the gas generating plants, rose to chief engineer, and then to vice-president of the company. He has many inventions in gas-making machinery and methods to his credit, and has long ranked as one of the foremost gas engineers in this country.

Several hundred of Mr. Williamson's associates in the Peoples company—from officers of the company to gas-makers—gave him a testimonial dinner at the La Salle Hotel in recognition of his thirty-three years of service.

F. C. Freeman Gives Illustrated Talk on Gas Making Before Engineering Society

"The Making of Illuminating Gas" was the subject of an illustrated talk given by F. C. Freeman, chief engineer of the Providence Gas Company, before the power section of the Providence Engineering Society.

Mr. Freeman showed the processes in gas-making from the time the coal is dug until it is placed in specially-constructed boilers for manufacture. He had a number of slides which illustrated the savings made within the past year in the cost of its manufacture.

Donald McDonald Urges Gas Conservation in Louisville, Ky.

The containers of Louisville (Ky.) Gas & Electric Company were emptied one day recently.

"It's because a very few families in Louisville burn large quantities of gas," said Donald McDonald, vice-president of the company. "These use as much as 10,000 cu. ft. of gas a day to keep their homes warm. The average home consumption of gas for cooking and heating is 250 cu. ft. a day.

"The ratio between the small consumer and the large consumer is 40 to 1, and as a result, forty small homes must do without an adequate supply of gas because one large home insists in being lavish in the use of gas as fuel."

Mr. McDonald said that 12,500,000 cu. ft. of gas a day comes to Louisville, Ky., and that the containers normally hold a reserve supply of 5,000,000 ft. The below freezing temperatures of the three days caused a drain of 1,700,000 cu. ft. a day on this reserve. He said normal temperatures again would cause the containers to be filled once more, if users of gas will conserve it.

Mr. McDonald said that there is no way to obtain more gas for Louisville and no remedy remains except conservation.

Construction Notes

$35,000 Gas Plant Contracted for in Oneida, N. Y.

The American Gas Construction Company, of Newton, Iowa, has been awarded a contract to build a new gas plant for the Adirondack Electric Power Corporation in Oneida, N. Y. This will cost about $35,000 and is expected to be ready for operation in the spring.

Koppers Company Planning to Build $15,000,000 Plant to Supply Gas to Chicago Company

Negotiations which the Peoples Gas Light & Coke Company, of Chicago, is now conducting with the Mellon interests of Pittsburgh with a view to their building a huge coke oven plant in Chicago to supply the Peoples Company with gas are making progress. Under the plan which is being worked out, the new works would be built by the Koppers company, a by-product coke concern owned by the Mellon family, under an agreement of the Peoples company to purchase its gas output. The plan also provides that the Peoples company shall have an option to purchase the plant within a stated period.

The plant, it is expected, would cost between $15,000,000 and $20,000,000, and the Peoples company, although it is bound by its ordinance with the city of Chicago to construct the plant, is unable to finance a project of such magnitude in the present condition of its credit. It is felt that the outlook for the company will be much improved if the proposed arrangement with the Pittsburgh capitalists is carried out. It will enable the company to obtain its gas by the coal process, at a smaller cost than at present from the water and oil process. It is hoped that the company's earnings would then increase sufficiently to enable it to finance the purchase of the plant from the Koppers company.

The gas company's ordinance requires that the new coke oven plant shall be ready by July 31, 1920, to supply 8,000,000,000 cu. ft. of gas annually, unless construction shall have been prevented by causes beyond the control of the company. The time limit may not be operative, however, inasmuch as construction has been delayed by American participation in the war, during which new building projects were restricted to those essential for carrying on the work for victory.

$1,000,000 Extensions and Improvements Under Way at Northern Indiana Gas and Electric Plant

The Northern Indiana Gas & Electric Company reports that shipments are beginning to arrive at its plant in Lafayette, Ind., and that work will begin at once on extensive improvements of the plant, which will cost approximately a million dollars. Some time ago plans were made for the improvements, but the coal strike and the consequent delays in shipments have retarded the operations until within the last few days. On account of the recent break-down of two of the old boilers, and the poor coal that it has been necessary to burn, the company's service has been poor, but Manager Thomas Donohue, in a recent statement, said that as soon as the new equipment is put in, which will be within the next few months, these conditions will be entirely modified.

Gas Companies All Over U. S. Installing New Apparatus and Remodelling

The following contracts for new installations have been awarded by gas companies all over the country to the U. G. I. Contracting Company, of Philadelphia, Pa.:

U. G. I. automatic controls for the operation of water gas set installations at the plants of the Malden & Melrose Gas Light Company, Malden, Mass.; the Lynn (Mass.) Gas & Electric Company, and the Seattle (Wash) Lighting Company.

Installation of carbureted water gas apparatus having a daily capacity of 810,000 cu. ft., at the works of the Clinton (Iowa) Gas & Electric Company.

Installation of carbureted water gas apparatus having a daily capacity of over 2,000,000 cu. ft., for the Seattle (Wash.) Lighting Company.

This company is also to install apparatus having a daily capacity of nearly 500,000 cu. ft. for the Pocatello (Idaho) Gas & Power Company.

Installation of a carbureted water gas apparatus, having a daily capacity of 7,000,000 cu. ft., for the Detroit City Gas Company. This is the fifth contract for water gas apparatus awarded by the Detroit company to the U. G. I., with an aggregate manufacturing capacity of 19,100,000 cu. ft.

The U. G. I. reports that its force is busily engaged on a large amount of remodeling work in gas plants in various parts of the country.

Improving Gas Service

The Sussex Gas Company, of Seaford, Del., is having new boiler tubes placed in its plant and is otherwise improving its service.

The company also has added an operator to have charge of the plant during the night.

Wallingford Company Orders 100,000 Cu. Ft. Gas Holder and 100 Hp. Boiler

A contract for the erection of a gas tank, of 100,000 cu. ft. capacity, has been awarded the Davis & Farnham Manufacturing Company of Waltham, Mass., by the Wallingford Gas Light Company, and the new addition will increase the gas storage 300 per cent and will furnish an ample supply in the future. The company will also install a new 100 hp. boiler and will be in a position soon to carry on operations on a larger scale than in the past.

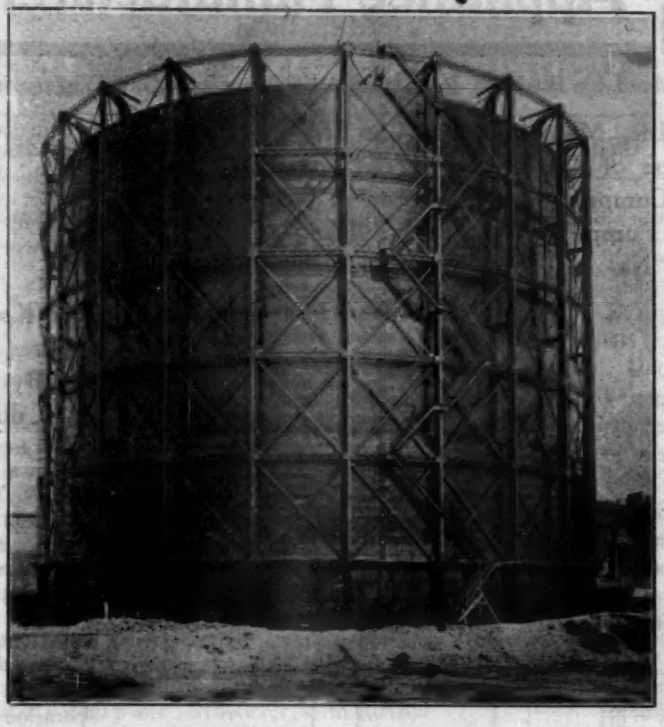
Drilling Equipment Ordered for Gas Wells in Tulare Lake Region

As a result of the bringing in of a natural gas well now flowing more than 20,000,000 cu. ft. daily in the Tulare Lake region of California recently, the California Natural Gas & Development Company and the Pacific Oil & Gas Company have ordered $100,000 worth of drilling equipment, which will be delivered immediately, and extensive development of the natural gas resources in this district will be undertaken. One rig has already been erected in the field by the California company, and the Pacific concern has ordered four others to be erected.

Exploitation of a field several miles west of the present gas producer will be launched to determine the extent of the gas field.

RITER-CONLEY CO.

PITTSBURGH, PA.



PURIFYING BOXES

STEEL TANKS

BUILDERS OF

TWENTY YEARS EXPERIENCE **GAS HOLDERS** HAS TAUGHT US HOW

STEEL CONSTRUCTION OF ALL KINDS

Philadelphia Pottstown Detroit Chicago Cincinnati
Washington New York Boston Syracuse San Francisco

GAS PURIFYING MATERIALS

NATRONA RED ORE
To Be Mixed With Fluffing Material

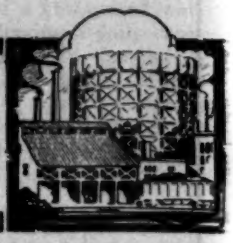
MINERAL SPONGE
The Best Fluffing Material

MINERAL SPONGE OXIDE
Prepared For Use

PENNSYLVANIA SALT MFG. CO.

WIDENER BUILDING
PHILADELPHIA PENNA.

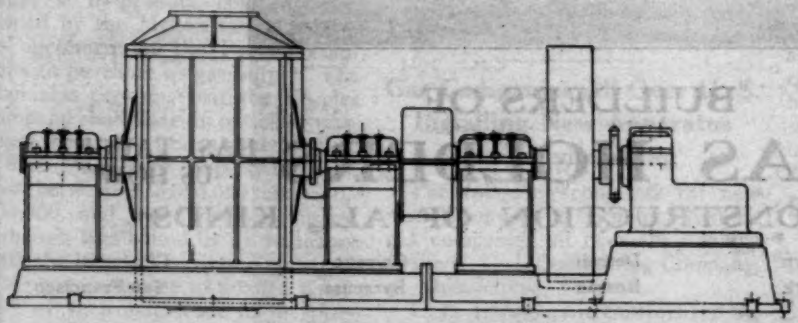
With The Equipment & Appliance Manufacturers



Conducted by Business Department of American Gas Engineering Journal

Horace G. Cooke, Inc., Manufacture New Type of Gas Exhausters, Gas Compressors and Gas Pumps Called the "National"

Horace G. Cooke, Inc., New York, manufacture the National Gas Exhausters and Gas Pumps, also two types of engines for direct connection with the gas exhausters and high pressure gas pumps. One type is the National Variable Speed Contra-flow Piston Valve, Porter Allen Gear, designed for hard, continuous 24-hour a day service where high steam economy is not the controlling factor. The other type is the National Stumpf Uniflow Engine for heavy duty service, but specially to meet conditions where high pressure superheated steam is used and high steam economy is desired.



500,000 CU. FT. PER HOUR, 7.5 LB. PRESSURE, NATIONAL GAS PUMP

The National Rotary Compressor is designed to eliminate pulsations (due to the pocketing of the air between the impellers), and produce a uniform flow of air or gas in the discharge pipe.

The company states that as both exhausters and engines are built in the same shop, absolute alignment on the entire unit is assured.

Safety Gas Stove Attachment to Prevent Accidental Turning on of Gas in Gas Ranges

In a circular issued by the Surety Attachment Company, Nashville, Tenn., is described a device to prevent the accidental turning on of gas in gas ranges.

The device is attached to the manifold by two simple clamps, one at each end; both of which are held rigid by means of a small spring in the clamp. The attachment may be put on by anyone. It is 18½ and 19 in. in length for the range top manifold and 8½ in. in length for the oven manifold. The attachment for the range top manifold weighs 1⅛ lbs., and the oven manifold attachment is considerably lighter in weight. Both attachments are made of cold rolled steel, nickel plated and with a wooden knob.

The simplicity of operation is one of the strong features urged by the manufacturers for the general application of the device. The device is locked and unlocked by means of a bayonet lock. When it is unlocked, the keys on the manifold are exposed to view and any or all of them may be turned on as required. When the device is locked, all the keys are automatically turned off and it is physically impossible for any of them to remain partially open. In this way, it is stated, leakage of gas is prevented. When the device is locked it is not exposed to the view of small children. The oven manifold attachment works in a similar way.

The Koppers Company Give Some Facts Regarding the By-Product Coke Industry in America

The first plant of by-product coke ovens was put into operation in Syracuse, N. Y., in 1893.

From 1893 to 1908 there were put into operation 3,799 by-product ovens, producing 4,201,226 net tons of coke per year, or 1,106 tons per oven per year. In 1908 these ovens coked 5,699,058 net tons coal, or 1,500 tons per oven.

At the close of 1918 there was in operation 9,282 ovens having a capacity to make 32,200,000 tons coke per year or 3,469 tons per oven per year. These ovens have a capacity to coke 46,000,000 tons coal per year, or 4,956 tons per oven.

The first Koppers by-product coke plant in America was built for the U. S. Steel Corporation at Joliet, Ill., and completed in 1908.

The largest by-product coke plant in the world has been built by the Koppers Company at Clairton, Pa., for the Carnegie Steel Company, consisting of 640 ovens.

Gas Bake Oven

The Famous Manufacturing Company, West Forty-second Street, New York, recently issued a circular describing the "Ramous Red Oven." These ovens are not only bread bakers, but will bake cake, pies and pastries. The president of this company is C. H. French, formerly with the Public Service Gas Company of New Jersey. Catalog giving prices and full information regarding this oven will be sent on request.